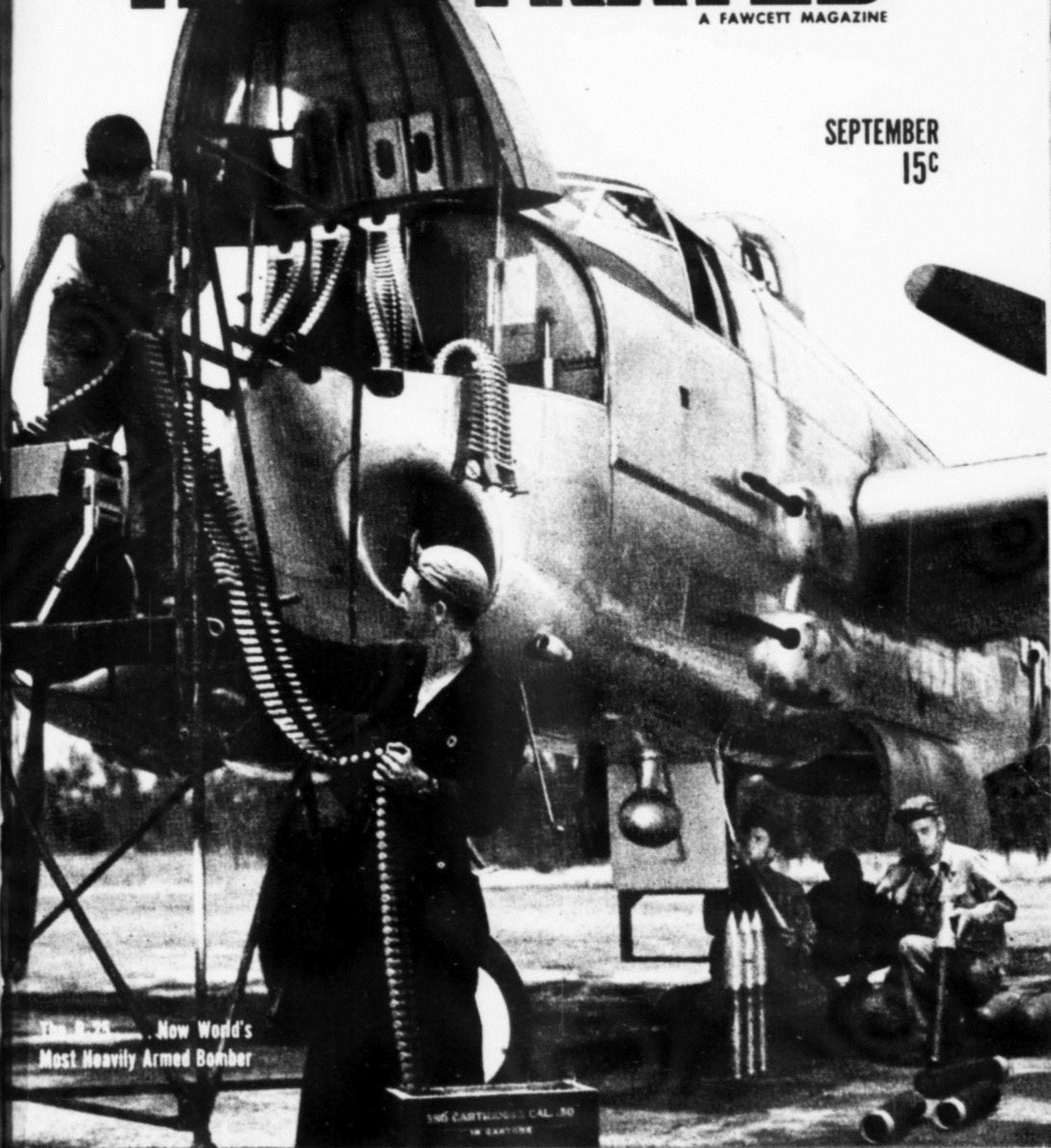


Механик иллустрейтед новое лучшее
Модерн меканикс новое лучшее том 9

MECHANIX ILLUSTRATED

A FAWCETT MAGAZINE

SEPTEMBER
15c



The B-29 . . . Now World's
Most Heavily Armed Bomber

340 CARTRIDGES CAL. .50
IN CARTON

IN FULL
COLOR:

NEW MAGIC WITH OLD FURNITURE

PAGE 67

MECHANIX ILLUSTRATED

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SEPTEMBER 1944

VOL. XXXII NO. 5

On the cover: The Mitchell B-25—now toting 14 machine guns.

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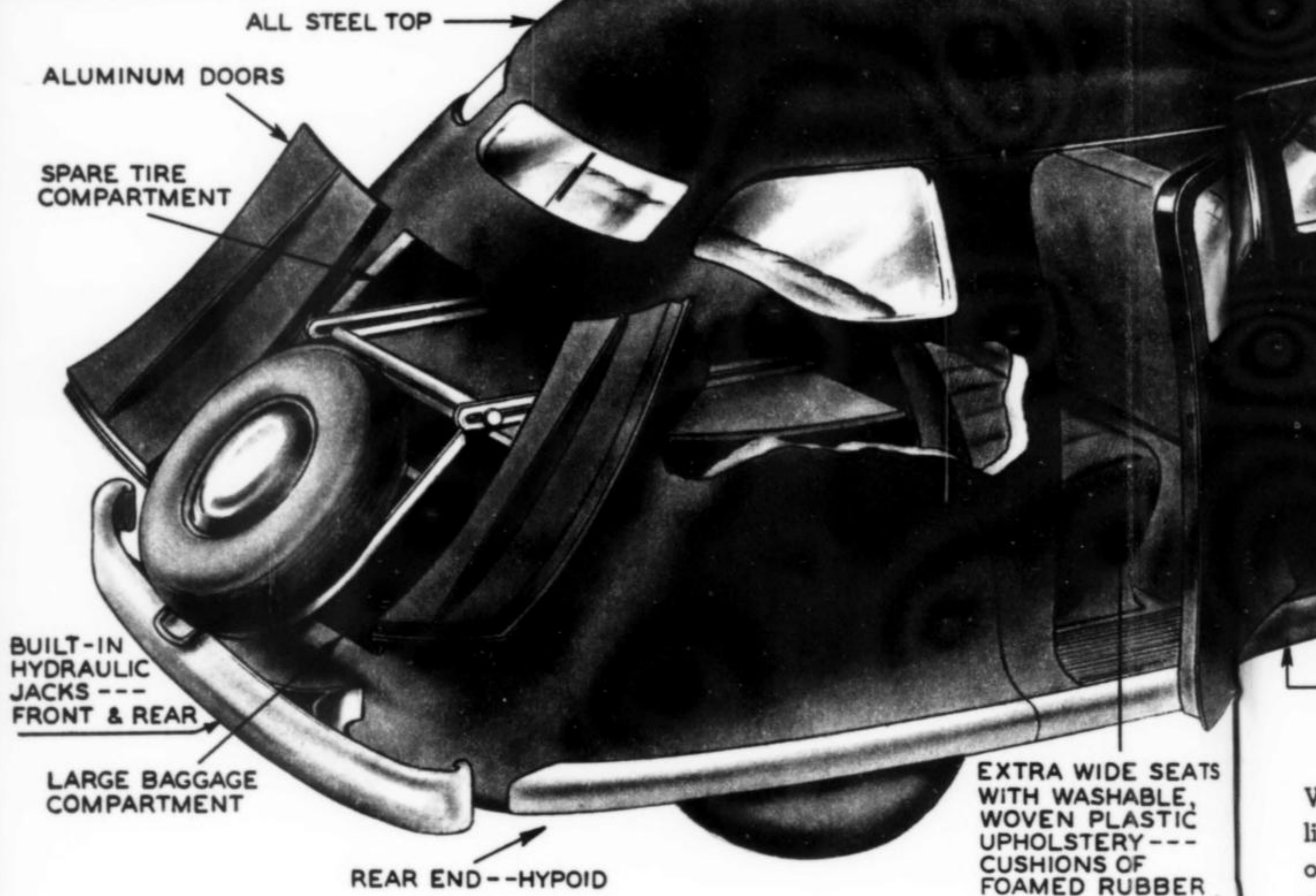
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Practical POST WAR CAR

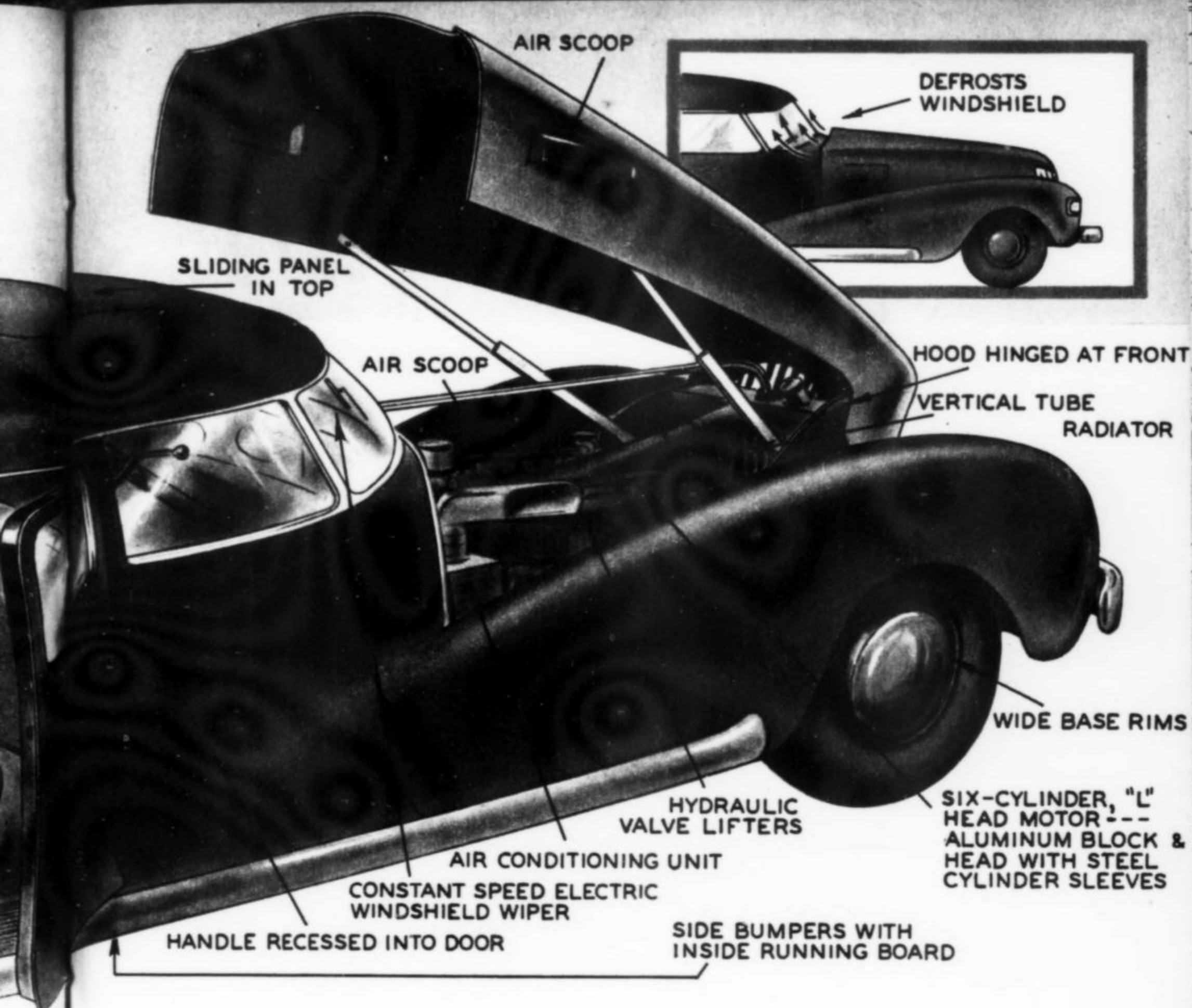
by Frederick C. Russell



ONE of these days Detroit may get us all hot and bothered about a rear-engined car with a transparent top and soy bean body; but right after the war most motorists will settle for something experience has demonstrated can serve admirably in helping them rediscover America by automobile. It need not be just a 1942 job with frills. Nothing so old-fashioned. They're looking for a car that is a tempting yet practical mixture of many of the best features which some car owners are now enjoying, with a few innovations tossed in for good measure.

I believe the car should carry a six-cylinder

engine because this gives better performance than a four but with less expense and fewer parts than are required for an eight. Sixes also are inherently balanced. For simplicity it would be an L-head, and to eliminate need for fussing with tappets it would have hydraulic valve lifters which keep clearances at zero regardless of motor temperature. Thus I would continue to enjoy the safety of low center of gravity without the current difficulty of getting at the valve compartment. For convenience in servicing this job the radiator would be placed well ahead of the engine and the firewall well back of it.



What an automobile expert believes millions of postwar motorists may really be offered in the way of a practical, medium priced car of thoroughly advanced design.

Wheelbase of this car would be not less than 120 inches, preferably more. History has shown that proponents of short wheelbase have invariably been forced to adopt longer wheelbase for roominess and comfort. Also there is no use sacrificing comfort for the slight advantage of a little extra convenience in street parking, which underground parking will rapidly supercede anyway. Weight should be around 3400 pounds. With speeds going upwards again after the war the advantage in the safety of a sturdy car will be an important consideration. Chief engineer of one of the [Continued on page 132]

THIS MAY BE YOUR POSTWAR CAR

MOTOR:

Six cylinder, L-head.
90 horsepower at 3200 rpm.

CLUTCH:

Improved fluid.

TRANSMISSION:

Three forward speeds, synchromesh.
High second gear for speedy traffic use.

REAR END:

Hypoid.

BRAKES:

Four-wheel electric. Manual brake on propellor shaft.

MOTOR FEATURES:

Aluminum head and block using steel sleeves.
Radiator shutters.
Closed cooling system with permanent anti-freeze coolant.
Water pump shaft driven so that both fan and pump won't fail at the same time.

Single downdraft carburetor with automatic choke.

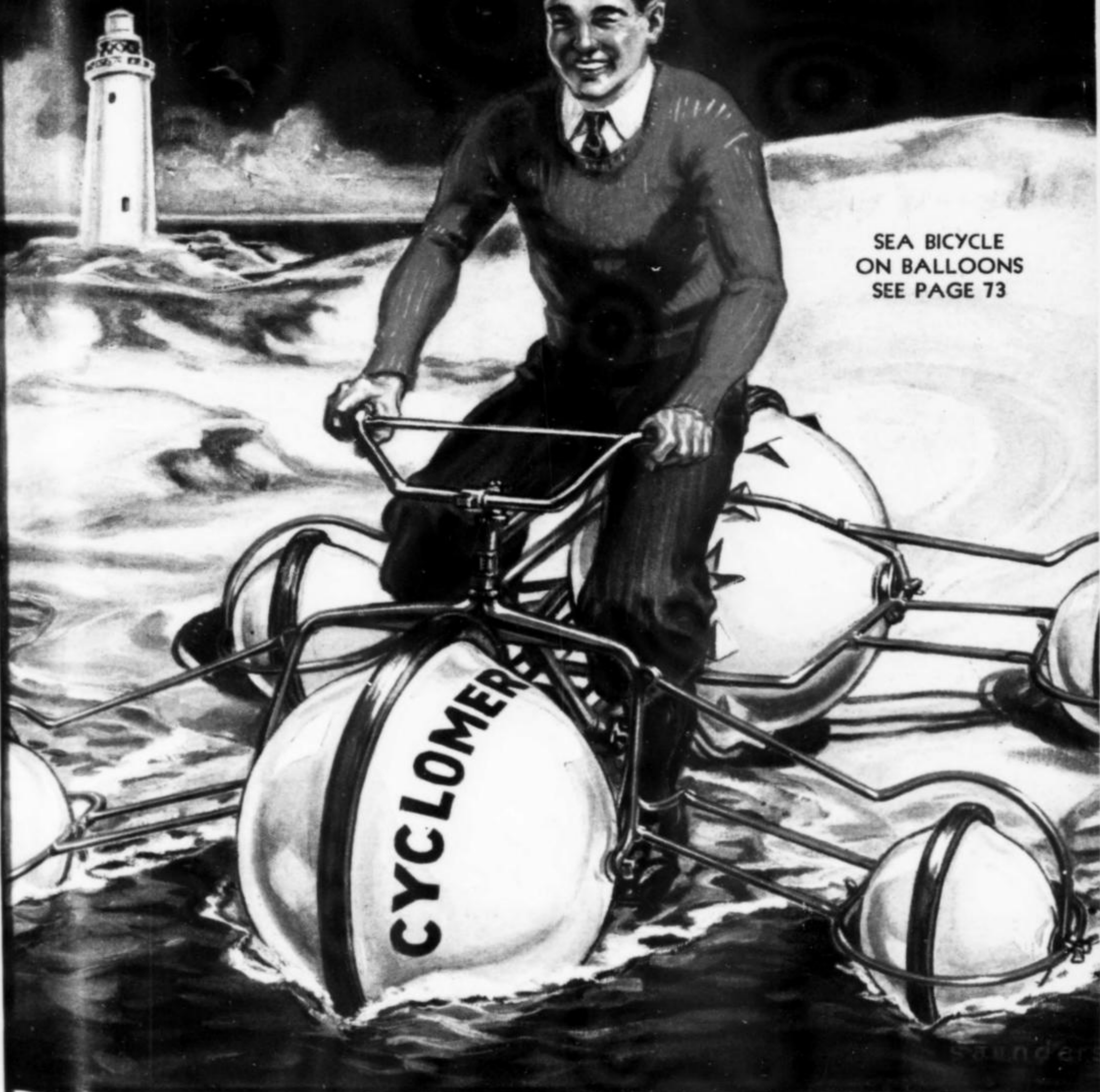
CHASSIS AND BODY FEATURES:

Flush door locks with recessed door handles.
Constant speed electric windshield wipers.
Wheelbase 120" or over.
Weight 3400 pounds.
Sunshine sliding panel in roof.

DEC. 25c
IN CANADA 30c

MODERN MECHANIX AND INVENTIONS

SEA BICYCLE
ON BALLOONS
SEE PAGE 73



IDEAS FOR MAKING MONEY

December,
1932

VOLUME IX
NUMBER 2

MODERN MECHANIX AND INVENTIONS

DONALD COOLEY
Editor

PRICE 25 CENTS
30 Cents in Canada

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Tailor's Leg Cut Off—He Builds Auto for One-legged Man



An automobile for a one-legged man. Joseph Freedman, crippled Philadelphia tailor and builder of the car, drives entirely by hand, save for one pedal. A 2-cycle motorbike engine furnishes power.

WHEN Joseph Freedman, 44-year-old Philadelphia tailor, lost a leg in an accident, one of the greatest hardships he experienced was being unable to drive a car.

Then old "Mother Necessity" was brought on the job, with the result that Freedman designed and built an auto which is operated entirely by hand, save for one pedal. The car, seen at the left, is powered by a 2-cycle motorbike engine and goes anywhere on its two motorcycle and two airplane wheels.

Antiseptic Ice Sterilizes Drinks

ANTISEPTIC ice, said to be able to kill dangerous germs in any drink in which it is placed, although no chemical germicide is present, has been put on the market in Germany. Manufacture of the ice is based upon the sterilization process using colloidal silver for the water from which the ice is made. The germ-killing effect is ascribed to silver set free in the water from silver plated sands with which the water is brought in contact.

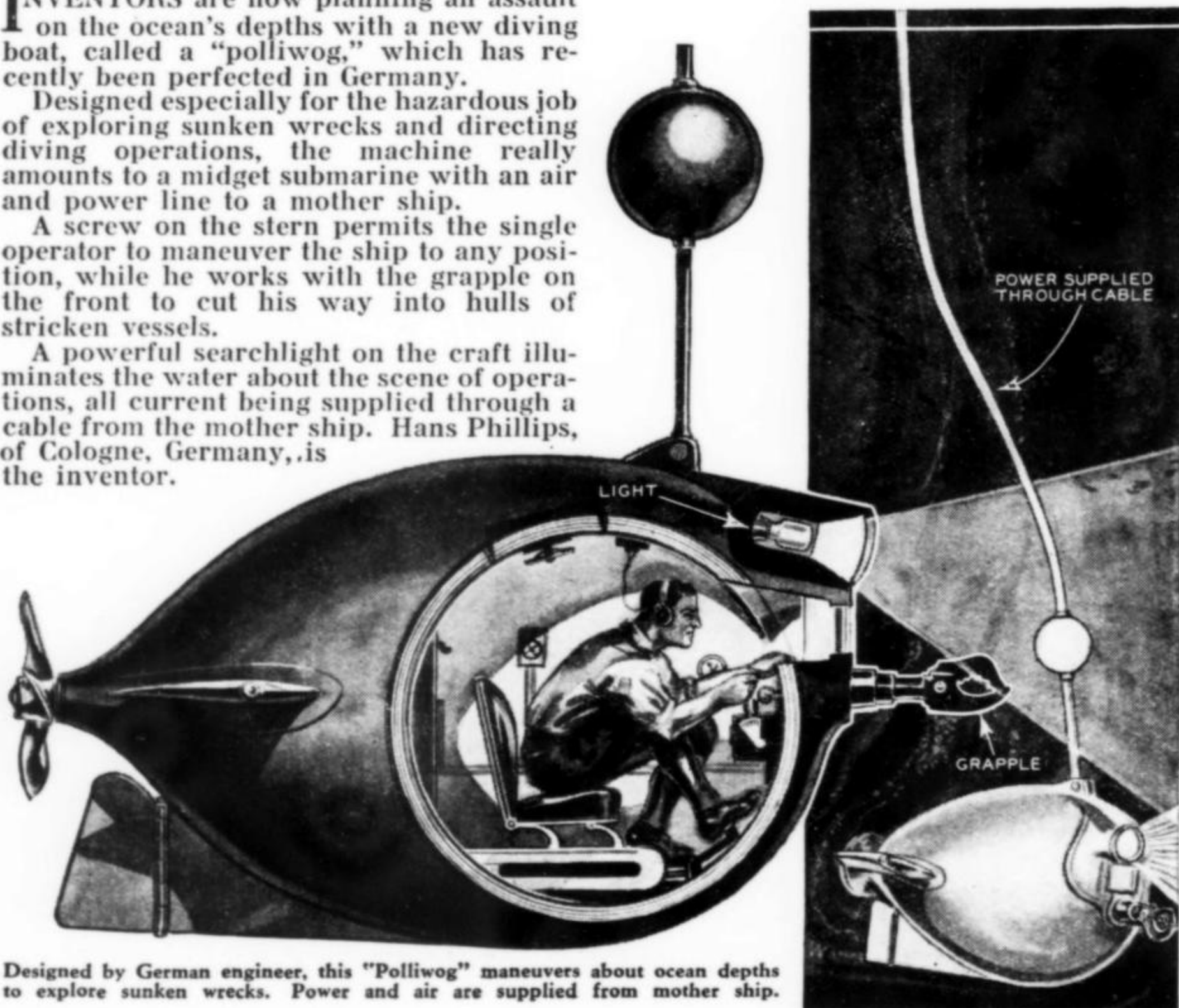
German Designs Midget Sub to Scout Ocean for Sunken Treasure Ships

INVENTORS are now planning an assault on the ocean's depths with a new diving boat, called a "polliwog," which has recently been perfected in Germany.

Designed especially for the hazardous job of exploring sunken wrecks and directing diving operations, the machine really amounts to a midget submarine with an air and power line to a mother ship.

A screw on the stern permits the single operator to maneuver the ship to any position, while he works with the grapple on the front to cut his way into hulls of stricken vessels.

A powerful searchlight on the craft illuminates the water about the scene of operations, all current being supplied through a cable from the mother ship. Hans Phillips, of Cologne, Germany, is the inventor.



Designed by German engineer, this "Polliwog" maneuvers about ocean depths to explore sunken wrecks. Power and air are supplied from mother ship.

PLANE TALK

Edited by DOUGLAS ROLFE

Hectagonal Hangar for Airship Terminals

WITH the day not far in the future when the oceans of the world will be criss-crossed with routes of giant airships, engineers are now setting about the task of designing hangars that can furnish docking facilities to fleets of air liners the size of the *Akron*.

From Germany come the first plans for a hangar, which, though radical in design, promises to remedy many of the difficulties encountered in housing ships of titanic dimensions. Outstanding among the advantages provided is that incoming ships can be run into the hangar in any wind, no matter what the direction and strength. In addition as many as three ships can be accommodated at one time, so that one does not have to be taken out to accommodate one arriving.

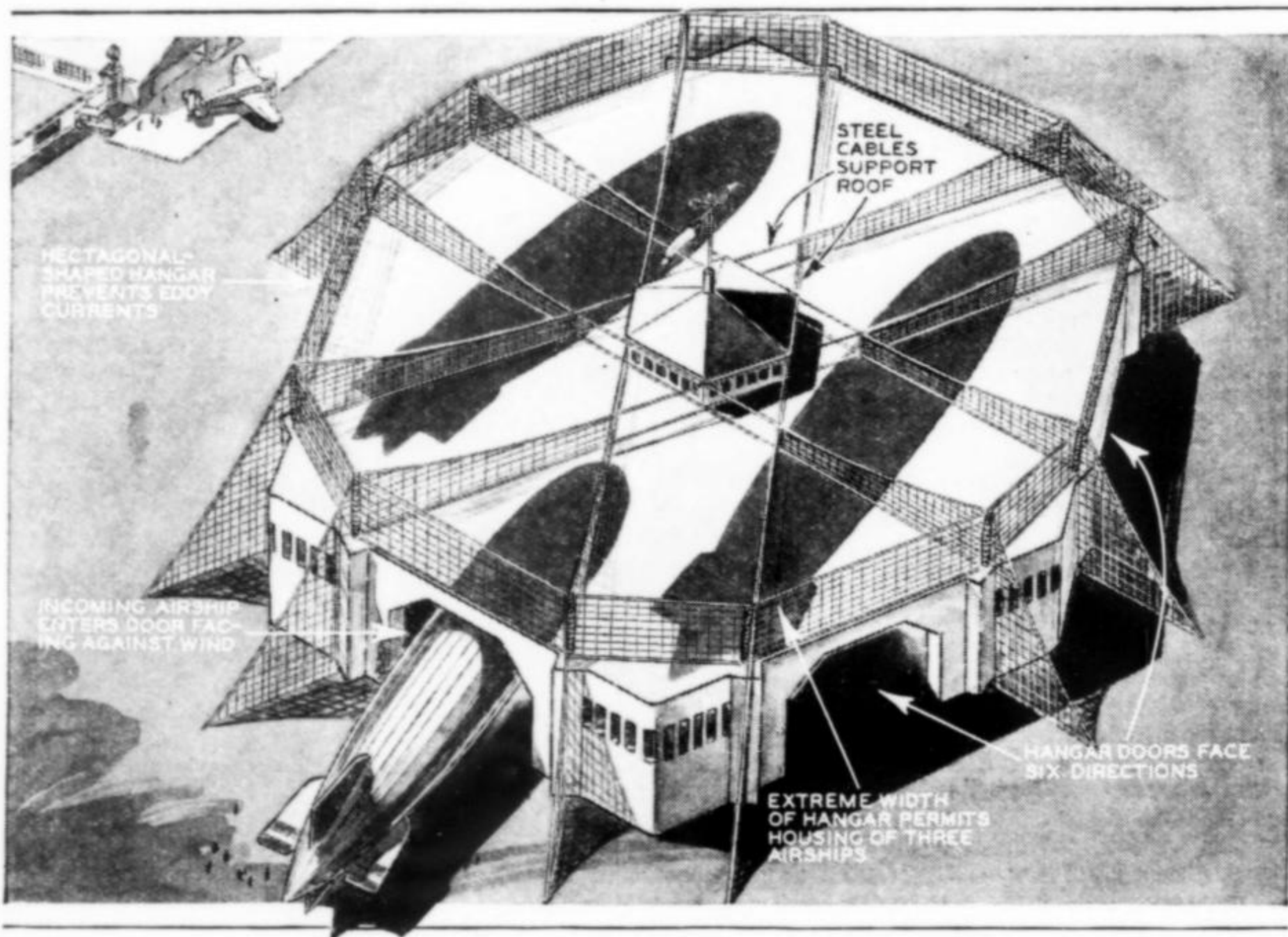
Construction of the hangar is illustrated in the artist's drawing below. Hectagonal in shape, the hangar has a door in each

side so that ships can be admitted from six directions, depending on the direction of the wind. Since the incoming air liner enters the door facing against the wind, there is little danger that it will be caught by a cross wind and smashed against the structure.

Once in, the ship can turn in any direction for its exit, like a freight train in a roundhouse. The extreme diameter of the hangar, over 1,000 feet, also permits the housing of as high as three Zepps at one time.

In designing the roof, the architect, Dr. Schmalhorst, of Dusseldorf, Germany, took a hint from the plans of the Chicago World's Fair Transportation building. In these plans the entire top is literally hung in the air, being supported by a system of steel cables passing over steel pillars at the sides of the structure.

Dr. Eckner has approved the design.



Giant trans-oceanic air liners of future will find adequate docking facilities in this hectagonal hangar of German design. Ships can enter any time regardless of wind direction and strength, thanks to the six doors, one on each side.

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APRIL 25c
IN CANADA 30c

MODERN MECHANICS AND INVENTIONS

FLYING WITHOUT
LEAVING THE GROUND
SEE PAGE 83



WHERE TELEVISION STANDS TODAY

BY DAVID SARNOFF of the RADIO CORPORATION

A FAWCETT PUBLICATION
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MODERN MECHANICS AND INVENTIONS

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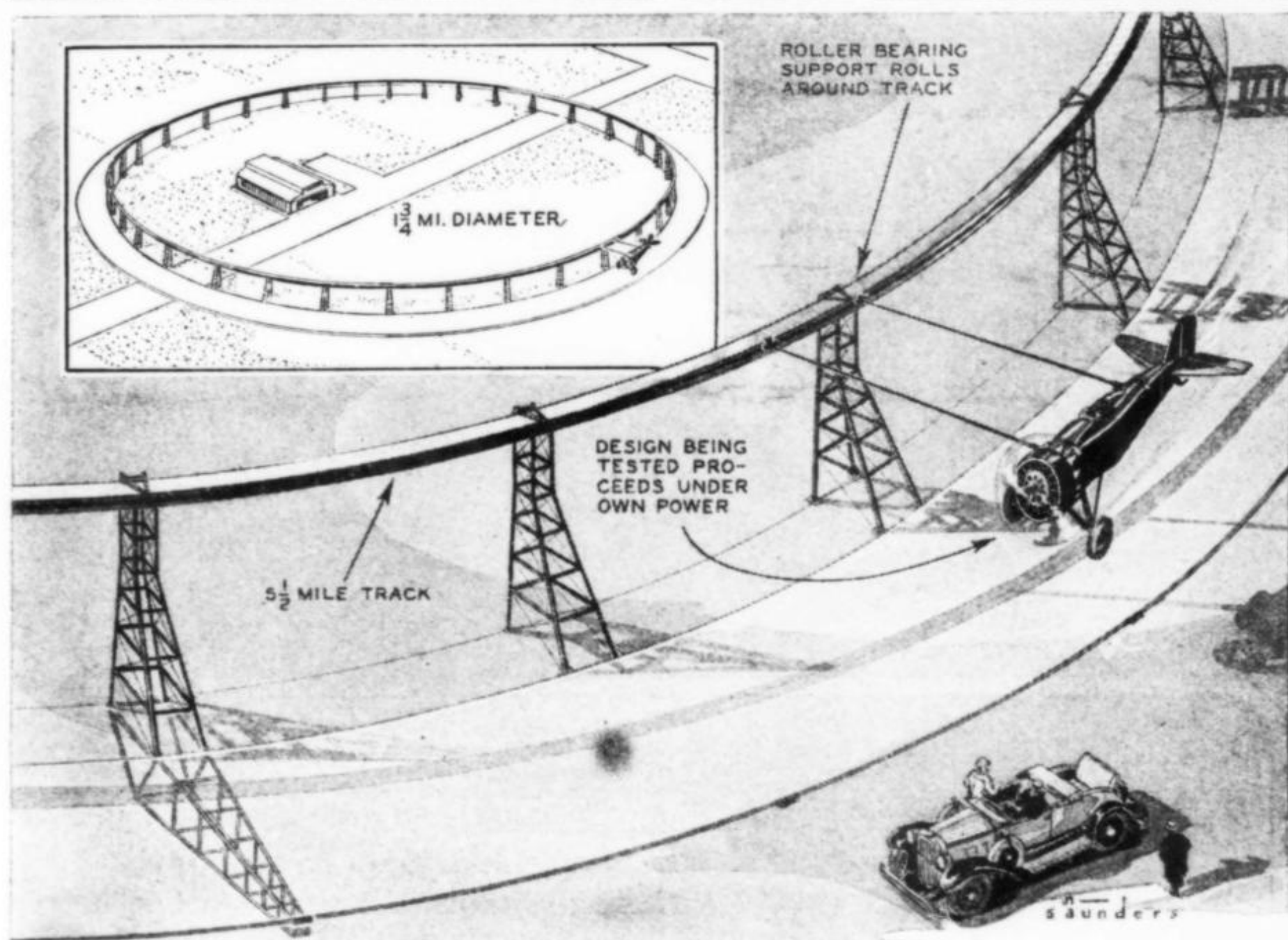
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Airplanes Tested Without Leaving Ground



The "Accelerdrome," a circular monorail elevated track $5\frac{1}{2}$ miles in circumference, on which airplanes may be given actual flight tests in comparative safety. The projected design is the work of M. Louis Bleriot and M. Esnault-Pelterie.

A NEW method of testing the power plant, streamlining, and other features of design under actual flight conditions, without the danger which is ever present when a new racing design first leaves the ground, has been proposed by M. Louis Bleriot, the French airplane designer and manufacturer who was the first man to fly across the English Channel.

The projected testing plant, to be known as an "Accelerdrome," will consist of a circular elevated monorail track five and one-half miles in circumference. The track will be supported by steel towers and will be surrounded by a concrete runway, or landing apron.

The airplane design to be tested, complete except for the wings, will be wheeled out to the apron and hooked onto two steel rods which are suspended from the monorail track by lubricated and ball-bearing casters. The plane will then proceed down the runway under its own power, centrifugal force causing it to leave the ground as soon as sufficient speed has been obtained.

This method of testing will permit the trial and perfection of engines, propellers, cooling devices, motor mounting, streamlining, and other problems.

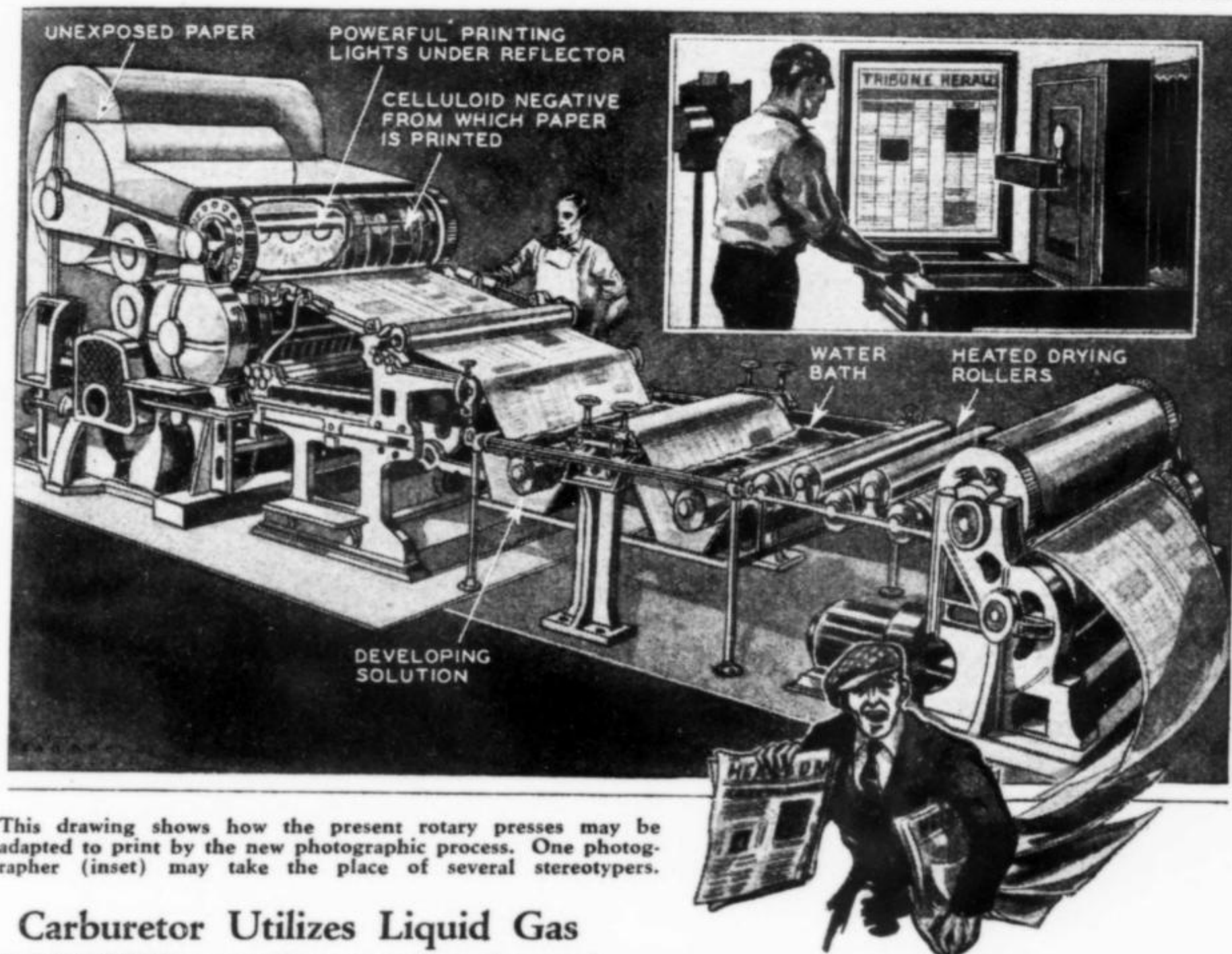
Atlanta Boy Builds Midget Auto

ALTON COBB, an Atlanta schoolboy, found an old washing machine motor lying about the house, and decided that it should be put to some good use. He converted it into an automobile engine and now has the contraption you see below.



Alton Cobb, of Atlanta, Ga., going for a spin in his gasoline "Chugmobile." The design, while extremely simple, shows considerable ingenuity. Note the gas-pipe brake.

Super-Speed PRINTING by Photography



This drawing shows how the present rotary presses may be adapted to print by the new photographic process. One photographer (inset) may take the place of several stereotypers.

Carburetor Utilizes Liquid Gas

LIQUEFIED natural gas may now be used in place of gasoline to drive internal combustion motors, thanks to the invention of a new type of carburetor suitable for use on any standard automobile or airplane engine. The gas will cost but four cents a gallon.



Thomas Brooks demonstrating his liquid gas carburetor.

THOSE who understand the properties of a new photographic emulsion believe that the day of printing by type will soon be past.

Printing is now slow and expensive. The cuts that go to make up magazines like this, cost several thousand dollars an issue, and a high grade of paper must be used if the magazine is to be kept attractive.

In place of using heavy stereotype plates and metal cuts, a new and cheap photographic emulsion has been developed which permits photographic impressions of great detail and clarity to be made at high speed on even the cheapest kind of paper.

The magic of modern chemistry has at last produced a cheap emulsion which is light sensitive without depending upon silver bromide.

Paper impregnated with this light sensitive material will be used on our printing presses and the rollers for printing, in place of carrying heavy lead plates of cast type, will carry nothing but transparent negatives with powerful electric lights showing through them.

The paper, issuing from a darkened chamber, will speed under the exposure roller and thence on to the developing solutions. From this point the paper rushes through a water bath and then through a series of electric dryers.

What Tomorrow's CARS



Phantom though it now is, 1940's automobile is already taking shape in engineering laboratories. Note the modified streamline cars shown in left foreground of this photograph, forerunners of design developments now taking place.

The automobile industry, always one of the country's most progressive, is today on the verge of astonishing changes in engineering design which are likely to make your next automobile so radically different in appearance that you'll hardly recognize it. Probable lines of development of tomorrow's car are here authoritatively presented.

PROFILES of automobiles, like profiles of women's hats, have a habit of changing swiftly and drastically in response to the whims of fashion.

This is perhaps the most significant observation carried away by the visitor to this year's automobile shows. For the profile of the typical 1932 automobile is so different from its 1931 predecessor that the dull-est eye cannot fail to distinguish the new models on the streets.

The 1932 Profile

What has happened to the body design of the new cars? The most obvious change has been the cautious approach to streamline form. Windshields slope backward at a pronounced angle; outside sun visors which were conspicuous in most 1931 models have been entirely removed. Rear quarters have been rounded off, and in some instances fenders have been flared and "dead space" between fender and wheel filled in to achieve better streamline proportions.

For the moment, let's pass over the numerous advances in engineering such as automatic clutches, free wheeling, automatic starting, and so on, and consider what the single factor of body design holds forth as a promise for 1940's automobiles.

Automotive designers are generally agreed that the "tear drop" body—that is, a body conforming in shape to a drop of water, blunt in front and tapering off at the rear—is sure to come into general popularity. The new automobiles, cautiously, are approaching that ideal.

Practically all the large automobile manufacturers are experimenting with tear-drop automobiles. Many of them are being tested out on private proving grounds; many others, disguised under conventional bodies, are piling up mileage on the highways testing the efficiency of engines mounted at the rear, and of other mechanical changes which tear-drop body styles will necessitate.

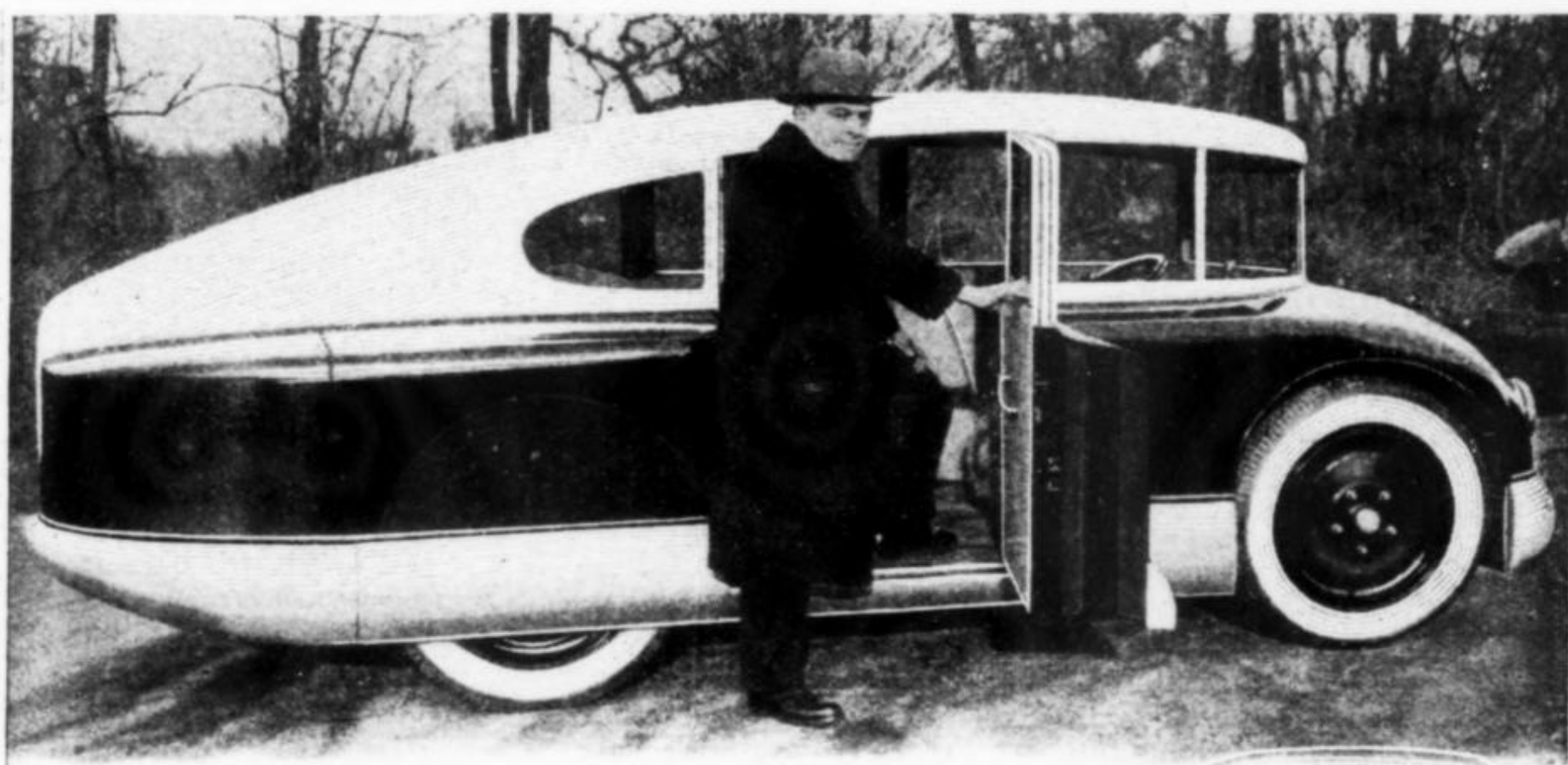
Today's Streamlined Examples

Only recently there appeared on the streets of New York two experimental automobiles which may be taken as an advance guard of tomorrow's cars. One of these is a four-wheeled model, the other three-wheeled. Both were designed by Capt. J. V. Martin, the famous airplane designer who built the well-known Martin bombers and other planes for the U. S. Army.

The four-wheeled car, a photo of which appears in this article, has a 34-horsepower motor installed at the rear which drives it

Will LOOK LIKE

by
DONALD
GRAY



This streamlined car with engine in the rear is the design of James V. Martin, noted airplane manufacturer. A bumper encircles the entire car, except at the side of the front wheels. Wheels are sprung individually with airplane shock cord.

at a top speed of 110 miles an hour, with an average gas consumption of 45 miles to the gallon. This phenomenal performance is mostly attributed to the minimized air resistance which the streamlined model has to overcome.

Speed tests on conventional cars have demonstrated the fact that simply by removing such obstructions as headlights and fenders, the top speed of a car can be increased some four to five miles. When one considers the fact that at high speeds practically the only resistance the car has to overcome (outside of internal friction) is air pressure, the true value of streamlining becomes apparent.

Cars Streamlined Underneath Too

In Capt. Martin's car, a continuous metal bumper encircles the base of the entire machine, except for a space alongside the front wheels required in turning. This bumper clears the ground by some six inches, and the entire riding compartment is scarcely more than half a foot off the ground. This low-slung center of gravity has two effects: it practically eliminates danger of overturning, and it makes possible a comparatively smooth surface underneath the entire car. Streamlining, in other words, must be continuous over the entire surface of the car. Each wheel in the Martin car has its individual spring. As a matter of fact, it is not a spring at all, in the orthodox sense, but rubber shock cord of the type long used in airplanes to absorb strains on the landing gear.

You have probably noticed the difference in riding qualities between the front and



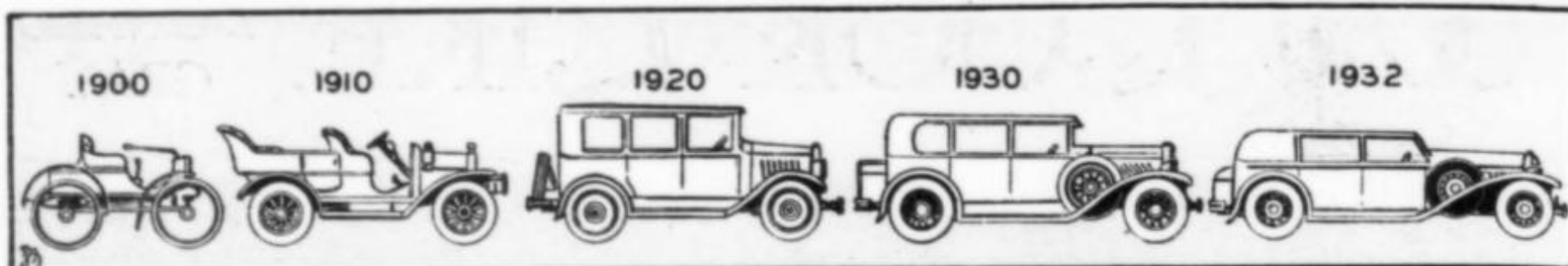
A removable hood exposes the engine in the rear, with screen-covered opening for the radiator fan. The 34 h.p. engine delivers 45 miles per gallon and gives a top speed of 110 miles an hour. Note rear-vision window in the roof.

rear seats of conventional motor cars. Most of the bounces and jolts are likely to affect the rear seat passengers, while the driver rides in perfect comfort. This is because the front seat is midway between the two axles of the car, where it is pretty well cushioned from jolts. In the Martin car, both seats are located between the axles, and this, in addition to the individual wheel suspension, is said to impart remarkable riding qualities.

Three-Wheel Design

The second car of Martin design is a three-wheeler whose most obvious novelty is the location of its door in the front. This arrangement gives it a closer approach to

Auto Profiles of Past 30 Years Show Increasing Use of Streamline Design



Profiles of cars the past 30 years show how streamlining has gradually come to the fore. The new 1932 cars practically all have sloping windshields with no visors projecting on the outside. The rear quarters are being rounded off.

the ideal tear drop form than any car yet designed. And for economy, this little car can have few rivals if it lives up to its advance notices. Eighty-five miles to the gallon of gas and a top speed of 75 miles an hour are promised.

Both of these streamlined cars have four-cylinder motors, with the transmission mounted in the rear of the car along with the engine.

Neither of these cars, of course, represents the ultimate 1940 design, but they are the first tangible evidence the public has had of the general trend of motor car design.

New Spring Suspension Styles

The entire system of spring suspension will be changed in tomorrow's cars. Springs will have no shackles and will, in fact, require no positive fastening to the frame, either by metal or rubber devices. This will leave them free to perform their suspension functions; they will no longer be required to take driving or twisting forces, as is at present the case.

Tires and wheels will be regarded as single units in the 1940 car. In fact, the wheel will be reduced to little more than a hub on which to mount a super-balloon tire that operates at air pressures of 10 to 12 pounds. Such tires are already on the market, developing out of the familiar "air wheel" which has proved so popular for airplane use. These tires, in conjunction with individually suspended wheels, will give new standards of riding smoothness unattained in the most costly present-day cars. The advantage of independent wheel suspension is that a wheel can absorb the jolt of a rut in the road without transmitting the shock through the entire chassis of the car.

Present automobiles universally use the four-stroke cycle gasoline motor. The two-stroke cycle motor, however, is being given

careful study and may be used in the next decade's cars. Such motors can be made lighter and more compact than the four-cycle type, and can deliver high turning effort at slow speed which is required for rapid acceleration.

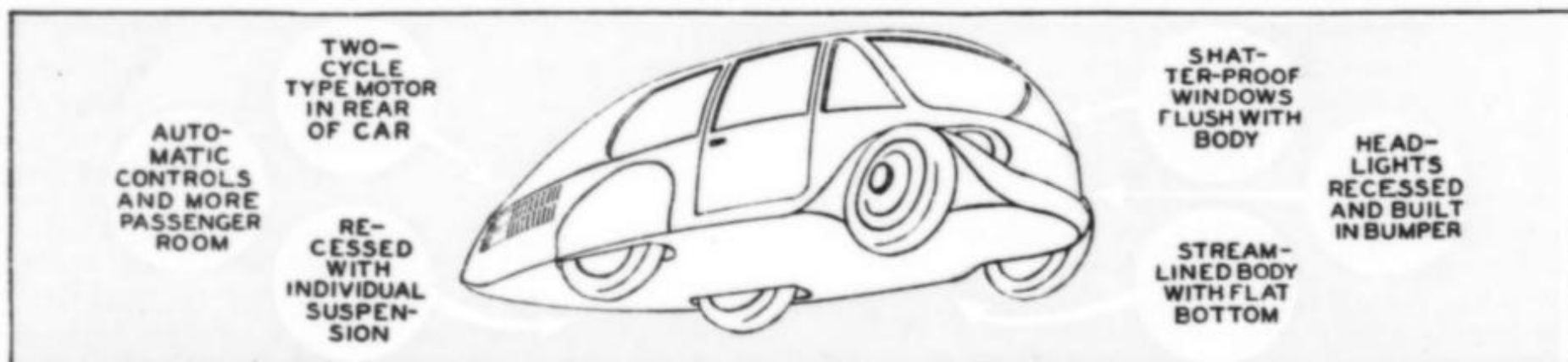
Why We Haven't Had Streamlined Cars

The Prince of Wales has for two years driven a streamlined car designed by Sir Denistoun Burney, builder of the British dirigible R-100. The car is very similar in its appearance to Capt. Martin's four-wheeler. Yet the British public has not yet fallen over itself in its eagerness to purchase this type of machine.

Why? Well, aside from initial expense, there is the objection that the public is not yet ready for cars of such bizarre appearance. And there is also the objection, advanced by some engineers, that streamline design is of negligible advantage on cars traveling at moderate rates of speed. This is perfectly true. When speeds approach sixty to seventy miles an hour, streamlining becomes tremendously important. Hold your hand out the window of a car traveling at this rate if you want some conception of the force exerted by so seemingly insignificant a thing as air pressure. Top speeds of sedans, it has been found, can be increased two to three miles an hour by so simple an expedient as closing all the windows!

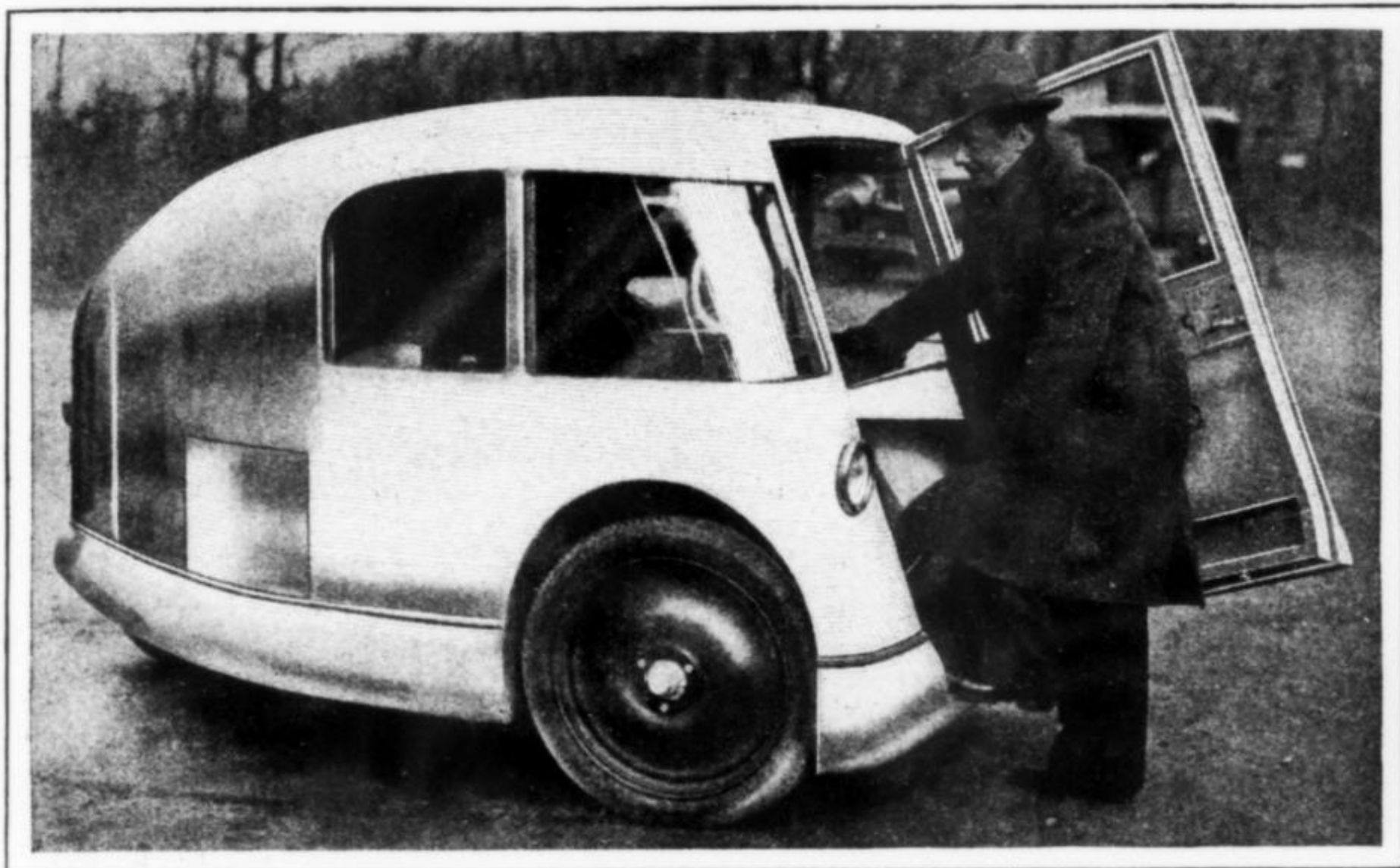
Advantages of Rear Engine Drive

But, though its coming will be gradual, in deference to the hesitancy of the buying public to invest in anything freakish, the tear-drop car is on the way. The single factor of moving the motor to the rear makes possible a body design with such unique advantages that it must eventually become universal. Heat and noise of the engine are *behind* the passengers, so that they can ride in comfort. Forward vision



Main lines of development on which automotive engineers are working are presented in the drawing shown above.

Three-Wheeled Car Has Most Perfect Tear-Drop Body Yet Designed



This three-wheeled car, with door in front, boasts an almost perfect tear-drop shape. It delivers 85 miles of travel on one gallon of gas, and can do 75 miles an hour at top speed with safety. It can be parked easily in small places.

becomes much less obstructed with the elimination of the long hood over which drivers must at present peer. That same engine can be better balanced at the rear. No long propeller shaft is necessary. This makes it possible to lower the frame of the car and smooth off its under parts.

Some of the developments announced on 1932 models will be applicable to tear-drop cars; others will drop by the wayside. For instance, many cars this year have announced X-type frames, in which the body members are braced by steel girders in the shape of an X between the members. Individual wheel suspension will eliminate the need for such rigidity; in fact, it will eliminate axles as we know them. Car frames will be built along entirely different lines.

But such advances as "startix," which cranks the motor automatically when the ignition is turned on, will be just as valuable in a tear-drop car as any other style. Likewise, free-wheeling, automatic clutches, and automatic gear shifts will always find favor. By the time the tear-drop car is commercially accepted, practically everything about it will be auto-

matic—it will probably halt by itself at sight of a red light.

Motors in the tear-drop car will not be the multi-cylinder type that have gained such favor recently. The reasons for this are obvious: the space in which the motors can fit is limited, and compact designs, probably V-type, will win favor. Instead of being mounted lengthwise, motors at the rear will very probably be placed crosswise of the car, with obvious savings of space.

Cost of producing such cars need not be any greater than with present types. The probability is that costs will come down, since so many heavy parts will be eliminated. Once manufacturers are assured of steady demand, they'll not hesitate to re-equip their factories for quantity production—and that's the answer to low unit price and the reason why we get so much value for today's automobile dollar.

Of course, when we get our new tear-drop cars we'll probably have to learn the technique of driving all over again, because we'll be confronted with entirely different operating conditions. But that's part of the fun!

1940's AUTOMOBILE will have, according to present trends:

Motor mounted in the rear of the car.

Streamlined "tear-drop" bodies.

Independently suspended wheels to absorb road shocks.

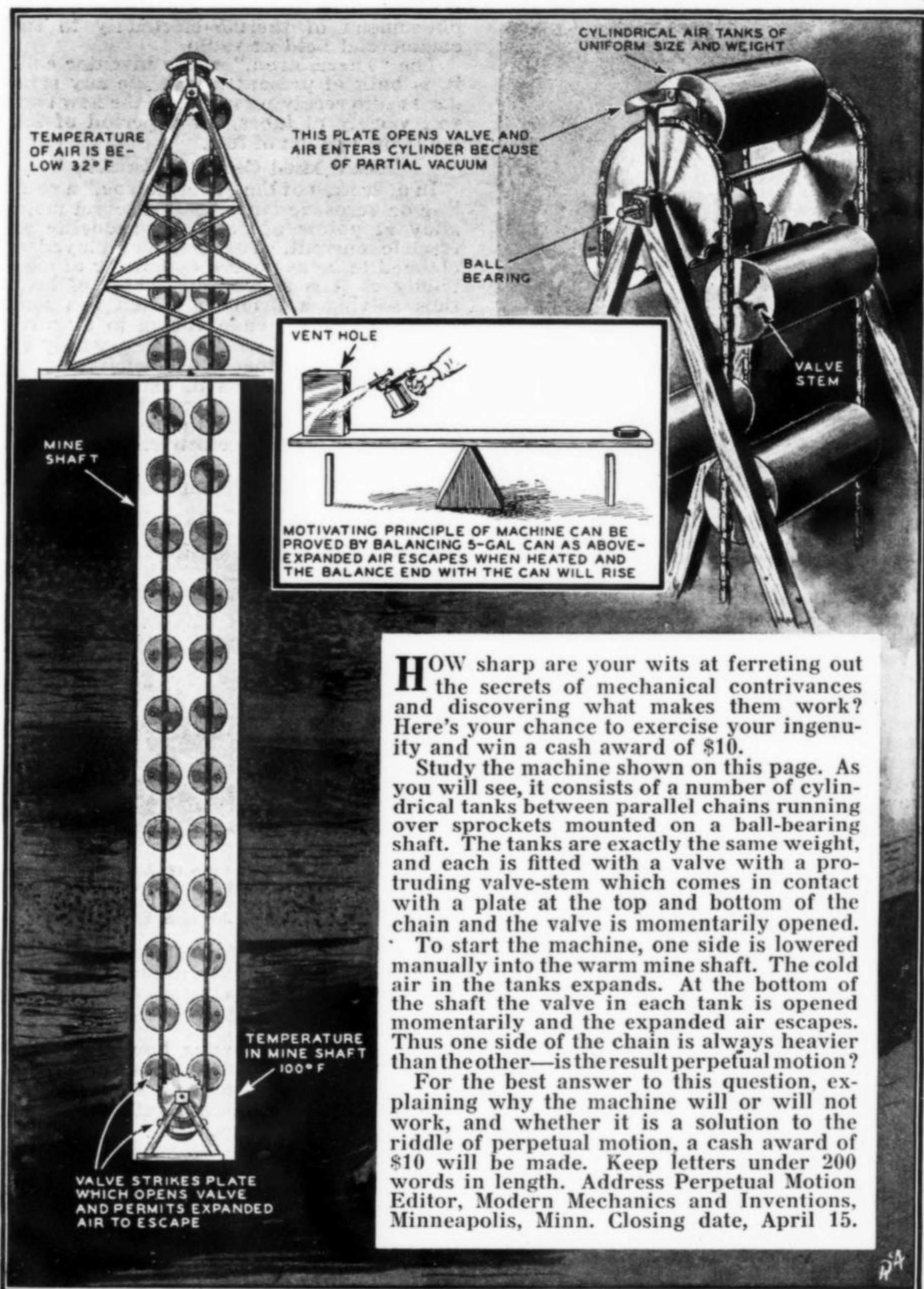
Super balloon (air-wheel) tires riding at 10 pounds air pressure.

Frameless chassis—that is, axles and heavy cross-members such as are now used will be eliminated.

Smooth riding qualities unequaled by any type of present-day car.

Elimination of motor and body noises and vibration.

\$10 for the Best Answer to the Question: *Will This Machine Work?*



HOW sharp are your wits at ferreting out the secrets of mechanical contrivances and discovering what makes them work? Here's your chance to exercise your ingenuity and win a cash award of \$10.

Study the machine shown on this page. As you will see, it consists of a number of cylindrical tanks between parallel chains running over sprockets mounted on a ball-bearing shaft. The tanks are exactly the same weight, and each is fitted with a valve with a protruding valve-stem which comes in contact with a plate at the top and bottom of the chain and the valve is momentarily opened.

To start the machine, one side is lowered manually into the warm mine shaft. The cold air in the tanks expands. At the bottom of the shaft the valve in each tank is opened momentarily and the expanded air escapes. Thus one side of the chain is always heavier than the other—is the result perpetual motion?

For the best answer to this question, explaining why the machine will or will not work, and whether it is a solution to the riddle of perpetual motion, a cash award of \$10 will be made. Keep letters under 200 words in length. Address Perpetual Motion Editor, Modern Mechanics and Inventions, Minneapolis, Minn. Closing date, April 15.

Swinging Pistol Holster Permits Quick Shot From Hip



Carried in new holster, gun is swung from hip as shown.

POLICEMEN who must be quick on the draw have a split second's advantage over their victim when wearing a new type of pistol holder which has recently been patented.

The function of the new holster is to make it possible, without removing the gun from the pistol case, to swing a six shooter or automatic into a firing position and shoot instantaneously. It also permits a faster and more efficient draw, as this action is two-thirds faster than with the present type holder.

With this swinging drop holster, the gun is suspended from the belt in a kind of swivel, as illustrated in the photo.

Low Grade Coal Deposit Makes Natural "Boiler" to Generate Electricity

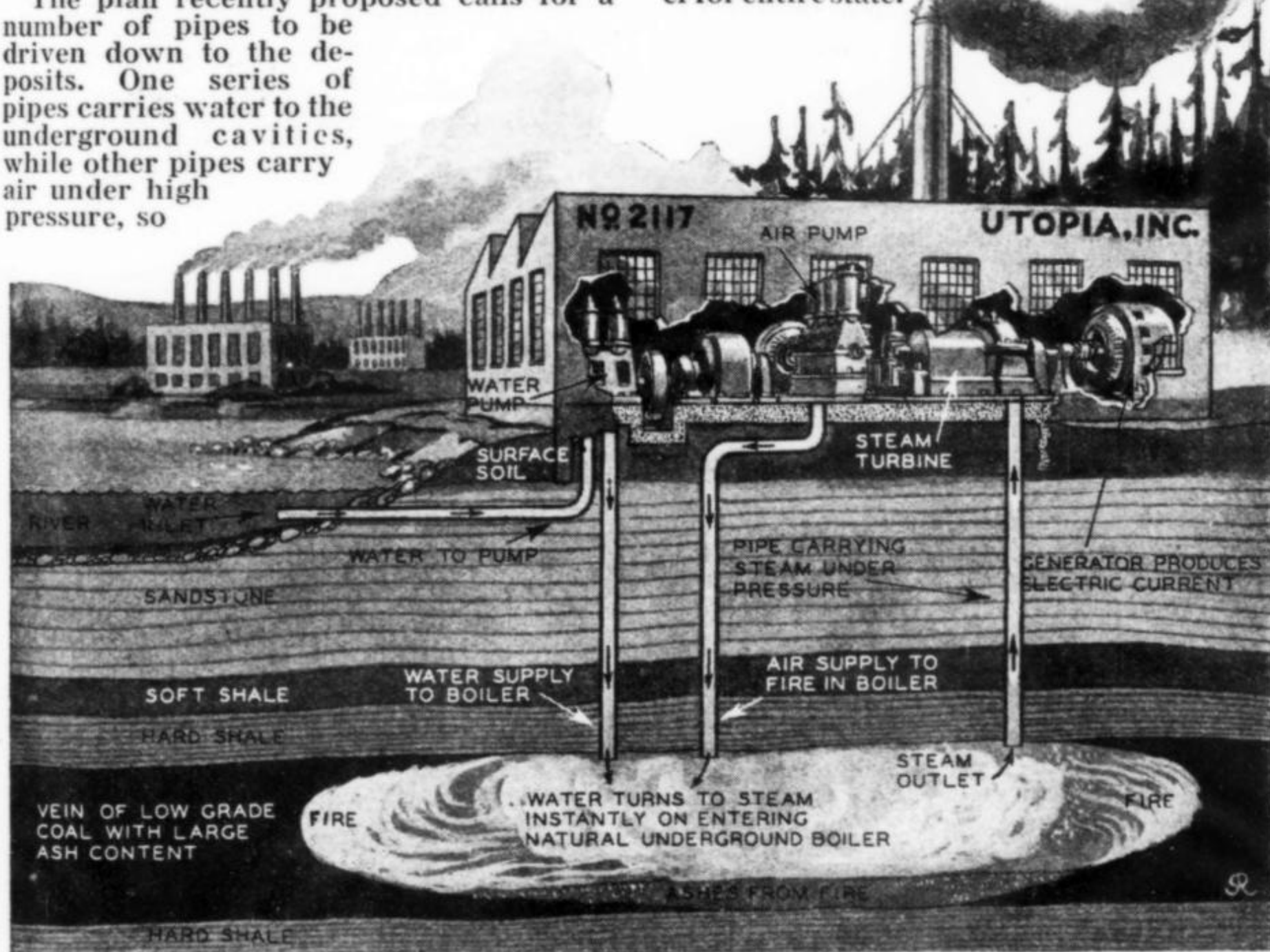
VISUALIZE two million straining horses lashed to a load that would be one-eighth the weight of Mount McKinley and you will have some idea of the tremendous power that will be generated in the low-grade coal districts by the super-power stations of the near future.

In the new method devised by engineers to utilize the country's vast deposits of low-grade coal, unsuitable for factory or home furnaces, Mother Earth is to be used as a boiler and burn this coal without ever bringing it to the surface.

The plan recently proposed calls for a number of pipes to be driven down to the deposits. One series of pipes carries water to the underground cavities, while other pipes carry air under high pressure, so

that the coal burning there will develop high heat. Still another series of pipes carries the steam generated to the power station high above on the surface.

At the power station, giant turbines, each producing 150,000 h.p., would permit the steam to expand and turn huge electrical generators. With this scheme, expensive boilers, boiler room attendants, as well as coal will be eliminated. This underground inferno will furnish power for entire state.



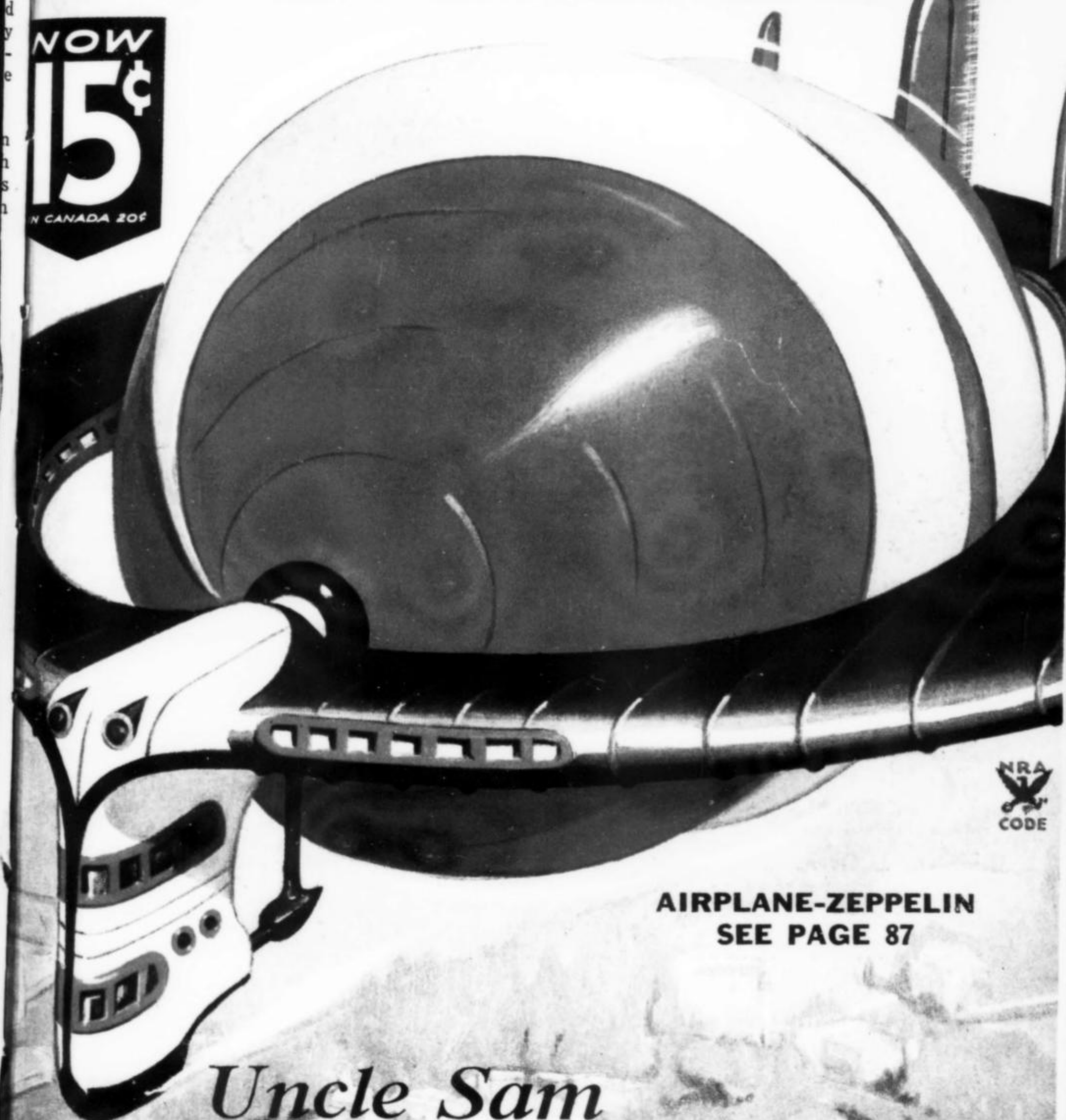
Fire burning in underground coal deposit generates steam, carried by pipes to 150,000 h.p. turbines in power station.

September
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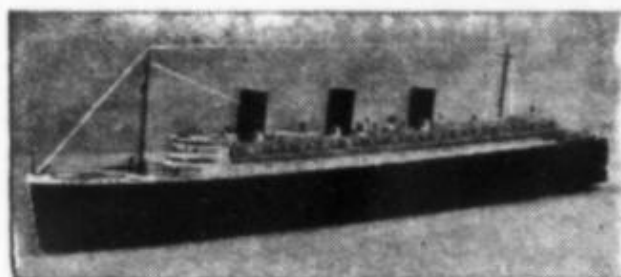
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Build Your Model of the S. S. Queen Mary



All eyes are turned on the S. S. *Queen Mary*, England's latest bid for supremacy of the seas. The mighty liner, now under construction, is more than 1,000 feet long and has striking lines which lend themselves beautifully to modeling. The October issue of *Modern Mechanix & Inventions Magazine* will contain detailed plans for building a scale model, complete, of the giant liner, S. S. *Queen Mary*.

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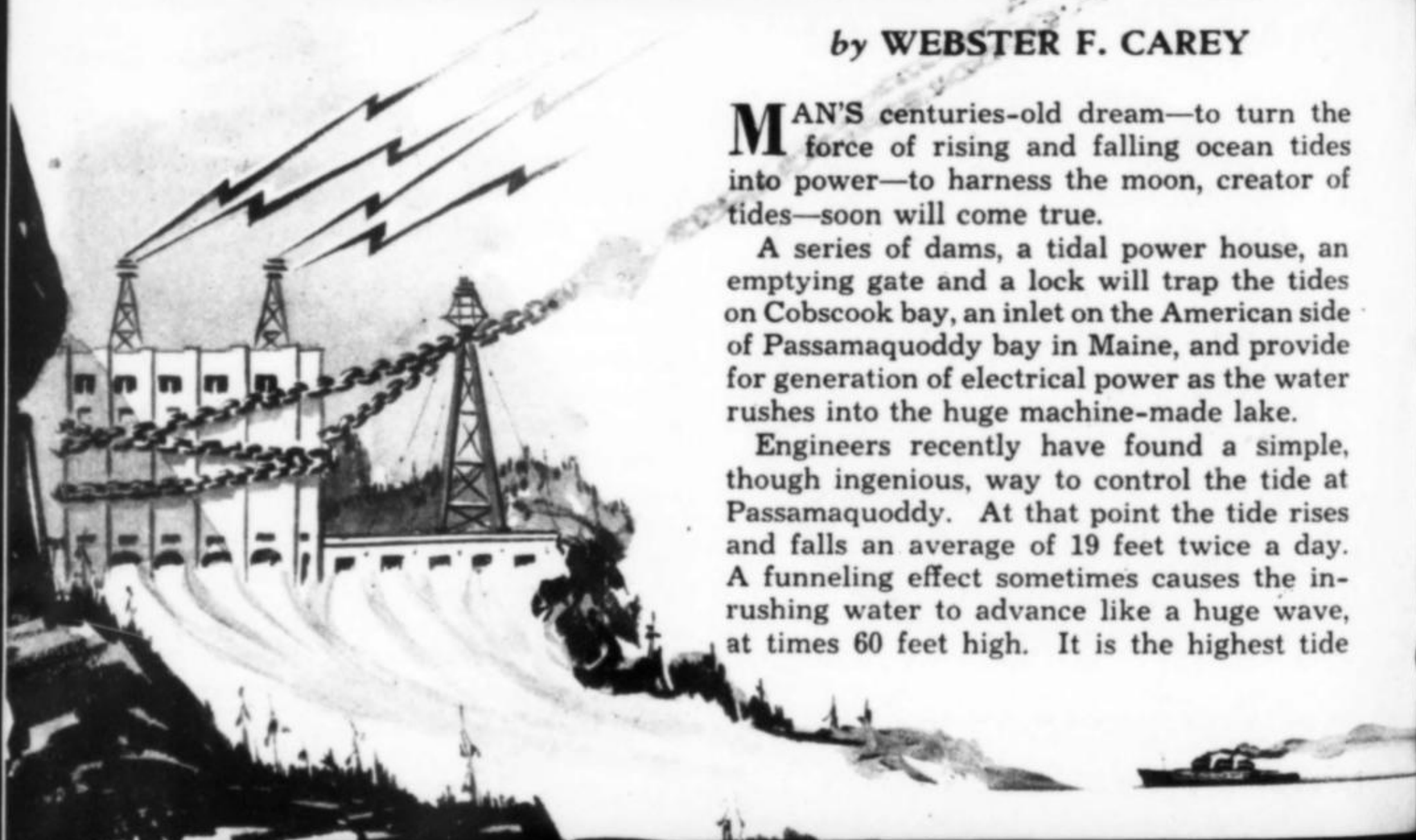


by WEBSTER F. CAREY

MAN'S centuries-old dream—to turn the force of rising and falling ocean tides into power—to harness the moon, creator of tides—soon will come true.

A series of dams, a tidal power house, an emptying gate and a lock will trap the tides on Cobscook bay, an inlet on the American side of Passamaquoddy bay in Maine, and provide for generation of electrical power as the water rushes into the huge machine-made lake.

Engineers recently have found a simple, though ingenious, way to control the tide at Passamaquoddy. At that point the tide rises and falls an average of 19 feet twice a day. A funneling effect sometimes causes the in-rushing water to advance like a huge wave, at times 60 feet high. It is the highest tide



UNCLE SAM

HARNESSES THE

Moon's Power

CANADA
PROPOSED DAM

CAMPOBELLO
ISLAND

TREAT ISLAND

DAM
SITE

EASTPORT

A huge dam will span the bay at this site, trapping incoming tidal waters. By harnessing the tides, Uncle Sam puts the moon to work, bringing to practical realization an age-old dream of engineers. President Roosevelt's summer home is on Campobello Island, just over Canadian border.

near civilization which provides usable power.

"Tide traps" now being designed by army engineers for the \$47,000,000 project come as near to harnessing perpetual motion and supplying perpetual power as any method yet devised.

A series of five dams, the largest four-fifths of a mile long, will cut off Cobscook bay from the Bay of Fundy, which is open to the sea. When completed, the water level in the bay will be maintained at the level of low tide. When the tide rises five feet, twice each day, the sea will be turned into the bay through a series of turbines.

Fourteen hours daily the turbines will whirl, as the tides rise from the five-foot mark to high, then flow out again. During each period the thirty-seven square mile lake will rise two and one-half feet. To empty it during each 90 minutes of low tide, the engineers will make use of 25 Venturi-type gates, each 30 feet tall and 30 feet wide at the narrowest

point. When the water levels inside the lake and in the outer bay become equalized, the gates will be closed, and when the outer water rises five feet, generators will hum again.

Although the "tide traps" will be closed down for two five-hour periods each day, the great project will furnish continuous power. Fifteen miles south of Cobscook bay the army plans to create an 8,000-acre storage reservoir. Levees will rise from 10 to 30 feet around the big basin to hold back the water.

As the tides rise and fall, surplus power will be transmitted over a high tension line to the reservoir to pump water from the sea 135 feet up into the new lake. During shutdown periods at the main tidal plant, this stored water will be used to generate power at the nearby Haycock power plant.

Funds provided by the Emergency Relief Appropriation of 1935 will make possible production of enough power to supply all industrial and domestic needs within a radius of

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Piccard's Ocean Diving Balloon

April, 1933

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VOLUME IX
NUMBER 6

MODERN MECHANIX AND INVENTIONS

Donald G. Cooley
EDITOR

♦♦

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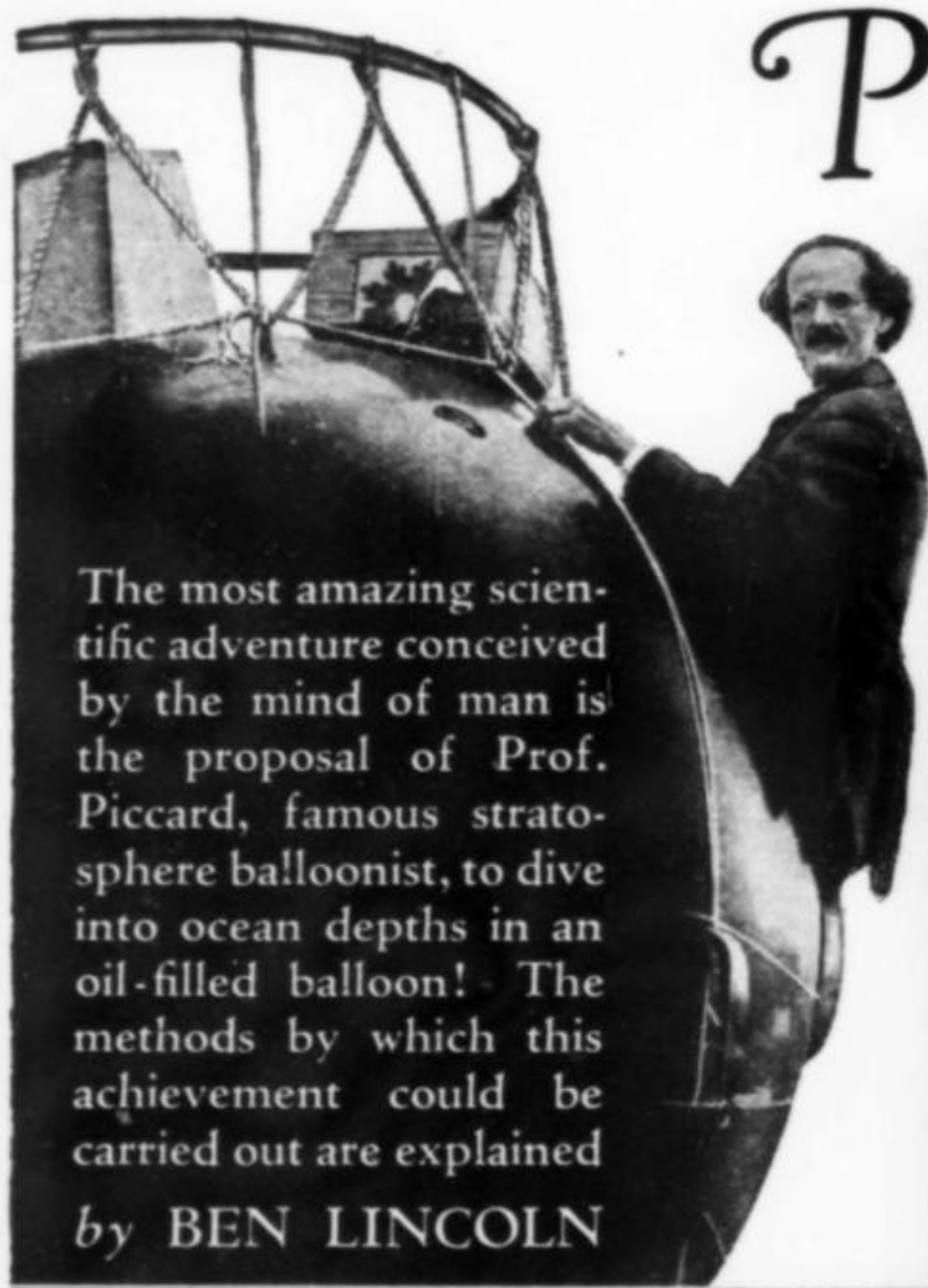
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PICCARD'S



The most amazing scientific adventure conceived by the mind of man is the proposal of Prof. Piccard, famous stratosphere balloonist, to dive into ocean depths in an oil-filled balloon! The methods by which this achievement could be carried out are explained by BEN LINCOLN

Prof. Piccard entering gondola on stratosphere flight.

SURPASSING the most fantastic undertaking ever projected in the name of science, and rivaling the fictional exploits of Jules Verne heroes, is the secret project planned by Prof. Auguste Piccard, details of which are revealed here for the first time exclusively for readers of MODERN MECHANIX AND INVENTIONS.

Already a world-wide hero in his own right for his explorations of the stratosphere in a balloon, the proposal of Prof. Piccard must be accorded the sober consideration to which his astounding achievements in the world of science already entitle him.

In short, Prof. Piccard's plan, truly the most astonishing idea brought forth in years, is to descend into unplumbed depths of the ocean in a balloon but little different from the one which carried him eleven miles into the air last summer!

Impossible? Apparently—until you realize how thoroughly Prof. Piccard has gone into the matter, and how completely he has overcome obstacles. It is Prof. Piccard's most cherished ambition to explore the ocean floor in his diving balloon, below the 2000 to 3000 foot depths to which William Beebe has penetrated in his Bathysphere.

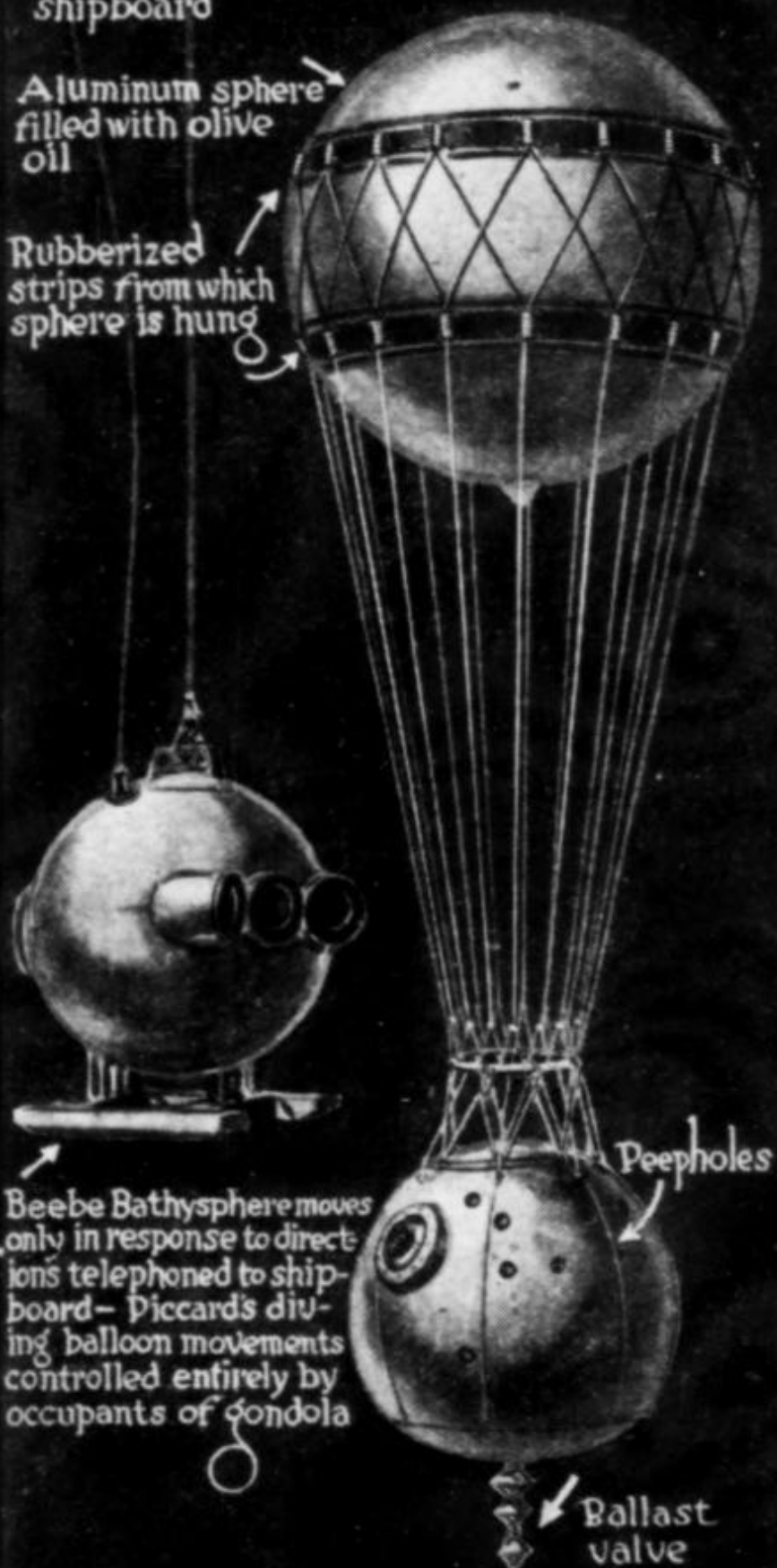
The idea is far from a new one to Prof. Piccard. Twenty years ago, while at the University of Zurich, he first planned an ocean-bottom exploration, but the war prevented. But the undersea balloon voyage was never abandoned. His decision to make a stratosphere flight rather than a



Beebe's Bathysphere movements controlled from shipboard

Aluminum sphere filled with olive oil

Rubberized strips from which sphere is hung



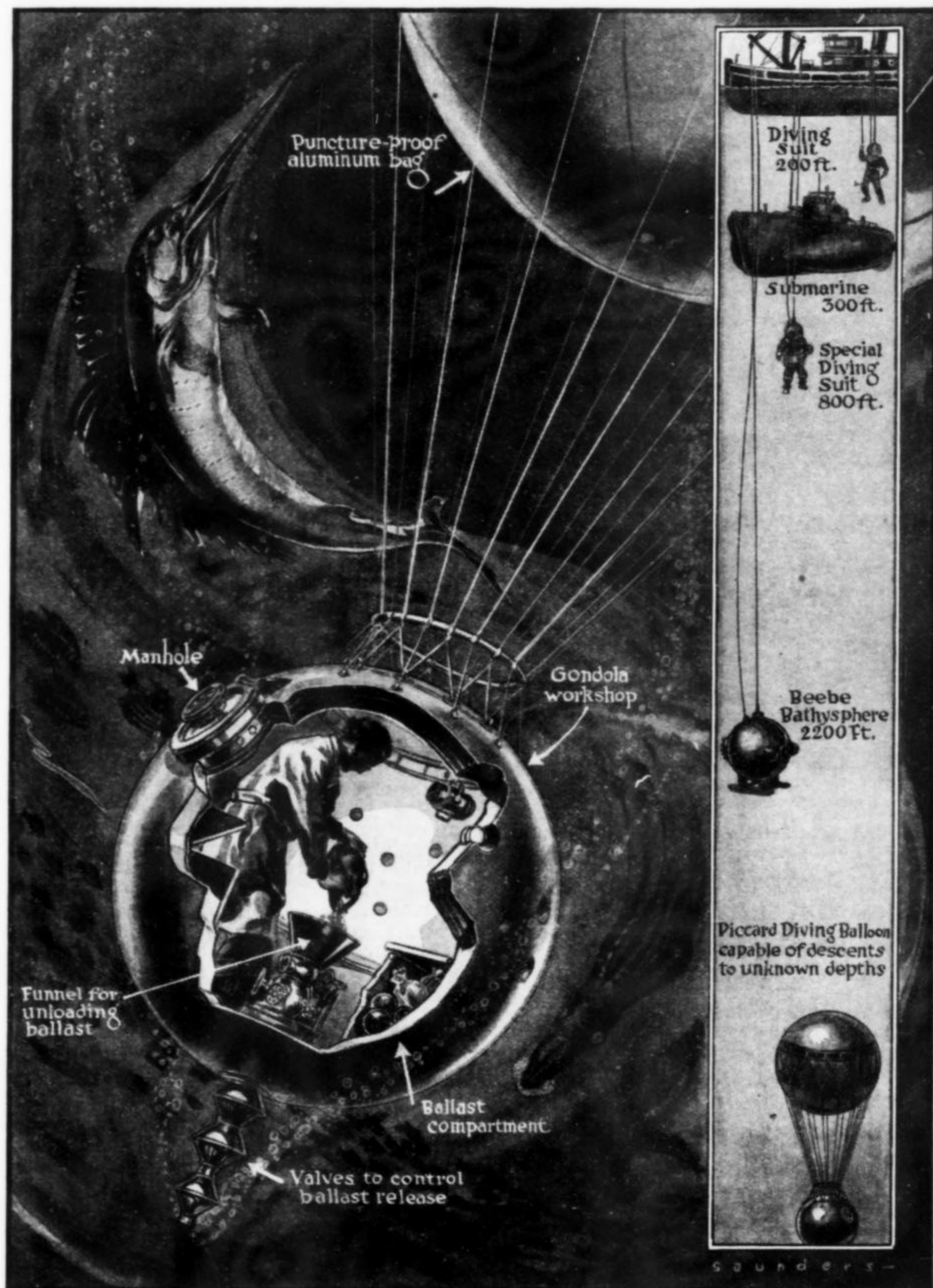
Beebe Bathysphere moves only in response to directions telephoned to shipboard—Piccard's diving balloon movements controlled entirely by occupants of gondola

Peepholes
Ballast valve

Comparative performances of Beebe Bathysphere, Piccard sea balloon. Advantage of latter is control from within.

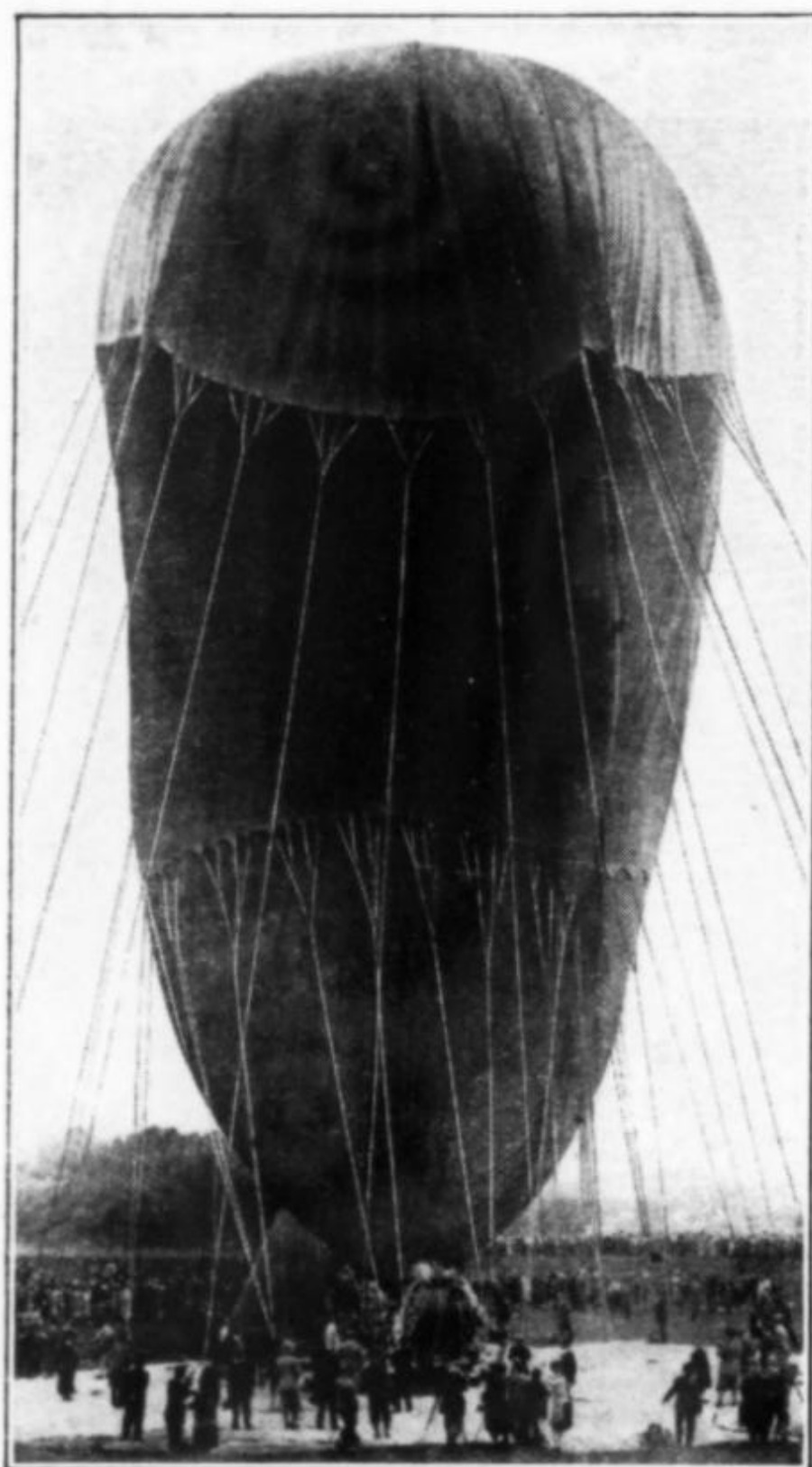
Modern Mechanix and

Ocean-Diving BALLOON



Interior arrangements of the diving balloon are strikingly shown in this drawing. Comparative depths to which different types of submarine machines can descend are given in the panel at the right. Note the mechanism for releasing ballast.

Diving Balloon Same in Principle as Bag Which Rises Thru Atmosphere



Bag of Piccard's record-breaking stratosphere balloon, previous to flight which carried him higher than any other man.

submarine descent was prompted by his interest in cosmic rays, which may be better studied at high altitudes than beneath the sea.

In its physical elements the submarine balloon would be the same as the stratosphere apparatus. A big aluminum ball would be the bag, but instead of inflating this with helium, hydrogen, or other gas as used in aeronautics, Prof. Piccard's plans call for plain olive oil made in the south of France.

As olive oil, or any oil for that matter, is lighter than water, the bag would easily rise to the surface when regulated by Prof. Piccard and his associate within the gondola. Lead bars and cannon balls, as well as powdered metals, will be carried as ballast. Prof. Piccard still has in his Zurich laboratory a pile of old cannon balls which he originally planned to take on his dive to ocean depths.

The bag of the diving balloon—or, more properly, the ball—will have two strong rubberized canvas belts to which the suspended cabin will be hooked by cables.

The cabin will hang 50 feet beneath the ball. Two manholes for entrance and exit are provided, and eight peepholes for observation, just as in the stratosphere gondola. Lately Prof. Piccard has thought of modifying the peephole arrangement to have but one opening of grilled glass; the advantage of such an installation would be the elimination of many possible sources of leaks which might develop under the tremendous water pressure.

Ballast Control Mechanism

But the crux of the whole amazing adventure lies in the methods by which Prof. Piccard would control the rise and descent of his unique submarine craft. William Beebe's Bathysphere, previously described in this magazine, has some points in common with Piccard's balloon, in that the underwater explorers are encased within a sphere of steel.

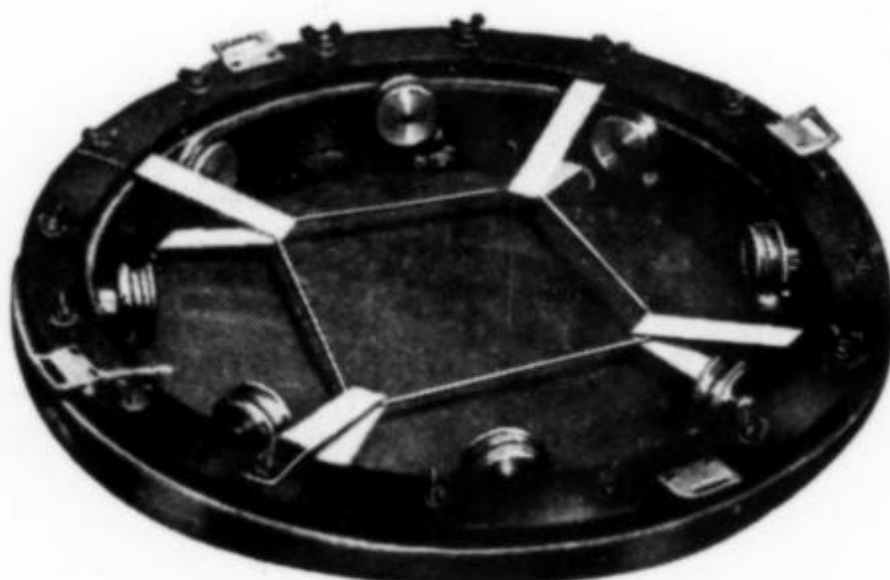
Here the resemblance ends. The Bathysphere is lowered from a ship's derrick, and its movements are entirely beyond the control of its occupants, except by means of telephoned directions. Piccard, on the other hand, will be able to control the vertical movements of his gondola at will, his diving balloon being entirely a self-contained unit.

The floor of Piccard's diving gondola will be made to contain a series of valve-controlled chutes, as illustrated in one of the accompanying drawings. These will be shaped somewhat like a funnel, fitted with shut-off valves at specific intervals, controlled by hydraulic pressure so that ballast may be released without water rushing in.

Lifting Power of Oil

As the weight in the cabin lessens, the oil in the aluminum ball lifts the craft to the surface. Careful calculations are, of course, necessary to determine the exact quantity of oil which would give buoyancy enough to return the balloon to the surface, but this is elementary mathematics to Prof. Piccard.

Safeguards will also have to be taken against suffocation, but the solution here will follow along the lines which worked



Valve for releasing gas on stratosphere balloon. In this sea diving balloon, Prof. Piccard has an entirely different problem to solve, since ballast must be carried in gondola and forced out against enormous pressure of the ocean.

Matter of Ballast and Valves for Releasing Vital to the Diving Balloon

out so successfully in the Bathysphere. Oxygen tanks, fitted with delicate valves permitting the escape of a measured quantity of gas per minute, will be installed. Also there will be two chemical units, one containing calcium chloride for absorbing moisture, the other soda lime to remove the excess carbon dioxide from the air.

Although cosmic radiation at great heights is Prof. Piccard's prime interest today, he will continue the same cosmic ray investigations when he is ready to make the ocean dive. Science would like to know if there *are* cosmic rays in the extreme depths of the sea. Always the scientist, and an adventurer only because of the fearlessness of his imagination, Piccard's prime object in the ocean dive is not sensational publicity, but the gathering of scientific data.

Pacific Ocean to be Site

Besides the cosmic ray studies, he will make a study of pressures existing at various depths. All of these investigations are complicated by the fact that instruments suited to the peculiar conditions of his gondola workshop do not exist; he will have to invent them.

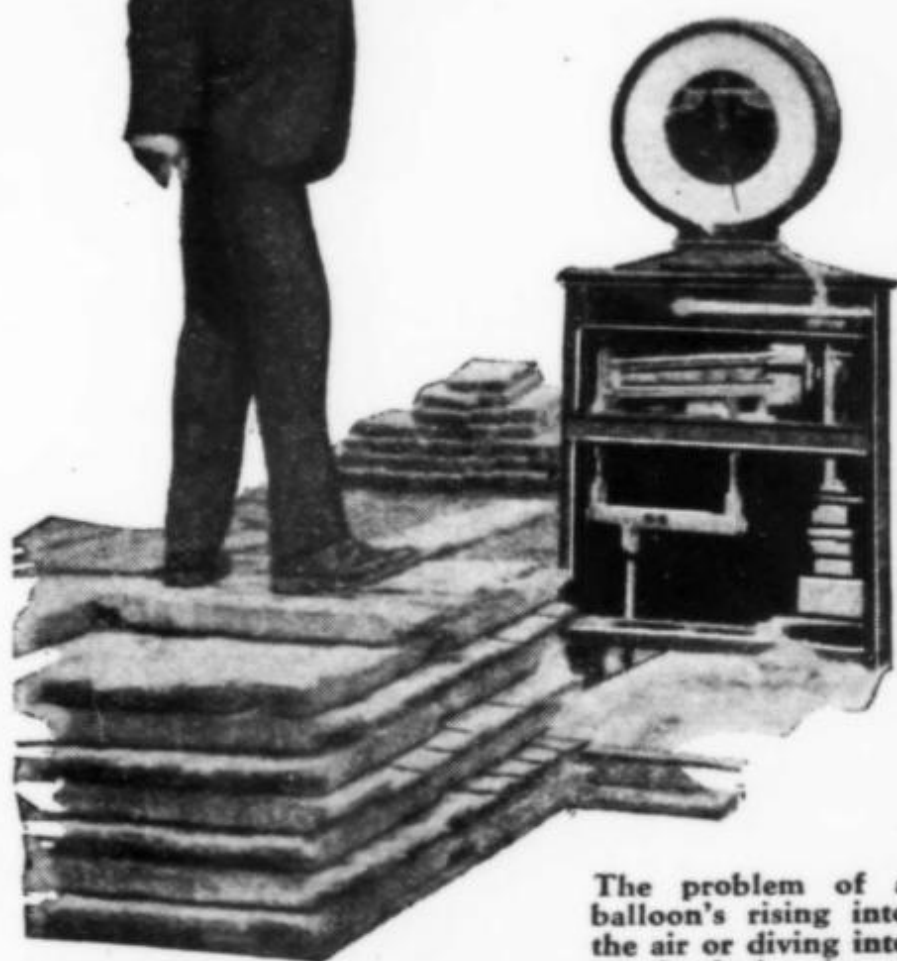
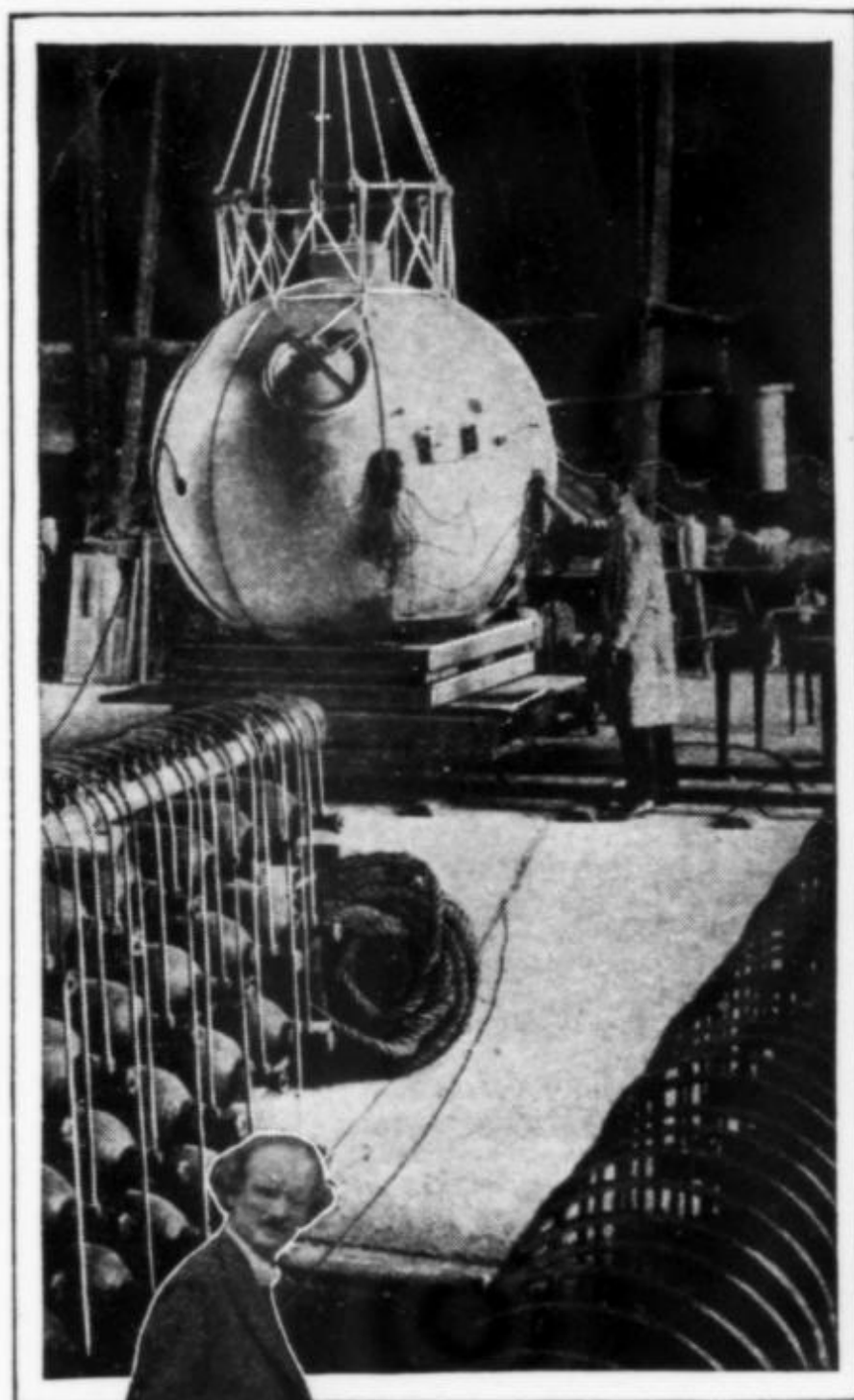
The Pacific Ocean will likely be chosen as the site of the descent. Because of the immense amount of careful work that must be done before the dive can be attempted, no definite time has been set for it. But Prof. Piccard has confided to his intimates that he might suddenly cease all his stratosphere operations to work on his diving balloon. The ocean's floor seems to be the sole remaining world left for him to conquer.

Currently, Prof. Piccard is working on plans for a stratosphere ascent in the vicinity of the North Pole, his object being to collect data which will show what differences, if any, exist in the amount of cosmic radiation in this area as compared with the more temperate climes in which his previous ascents have been made.

Balloon exploration of the stratosphere is no longer solely Prof. Piccard's province, however. Late reports are that scientists of Soviet Russia are secretly building two balloons of 35,000 and 29,000 cubic feet capacity in an attempt to double the 10-mile height attained by Piccard. When one realizes that the capacity of Piccard's famous balloon is but 4,000 cubic feet, the ambitious proportions of the Russian experiment are apparent.

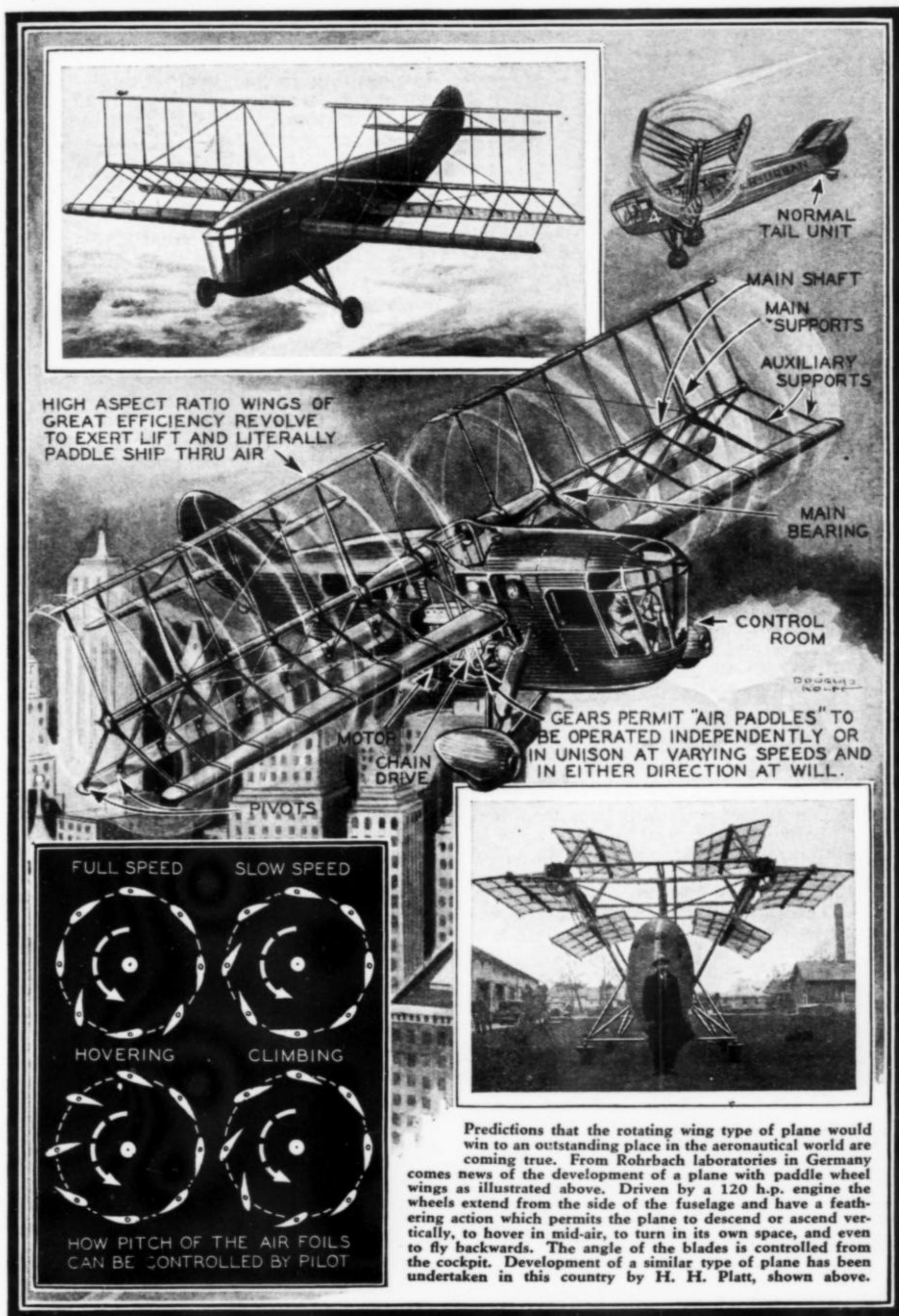
A newly discovered fabric is being used in the Soviet gas bags. Hermetically sealed gondolas of the familiar spherical type will be used, but a new metal alloy is employed which, it is claimed, reduces resistance to the passage of cosmic rays and permits a more accurate measurement of them.

A further demonstration of Piccard's fertile inventiveness is found in the news that he has created a rocket which he believes can be made practical for trans-Atlantic mail and passenger service.

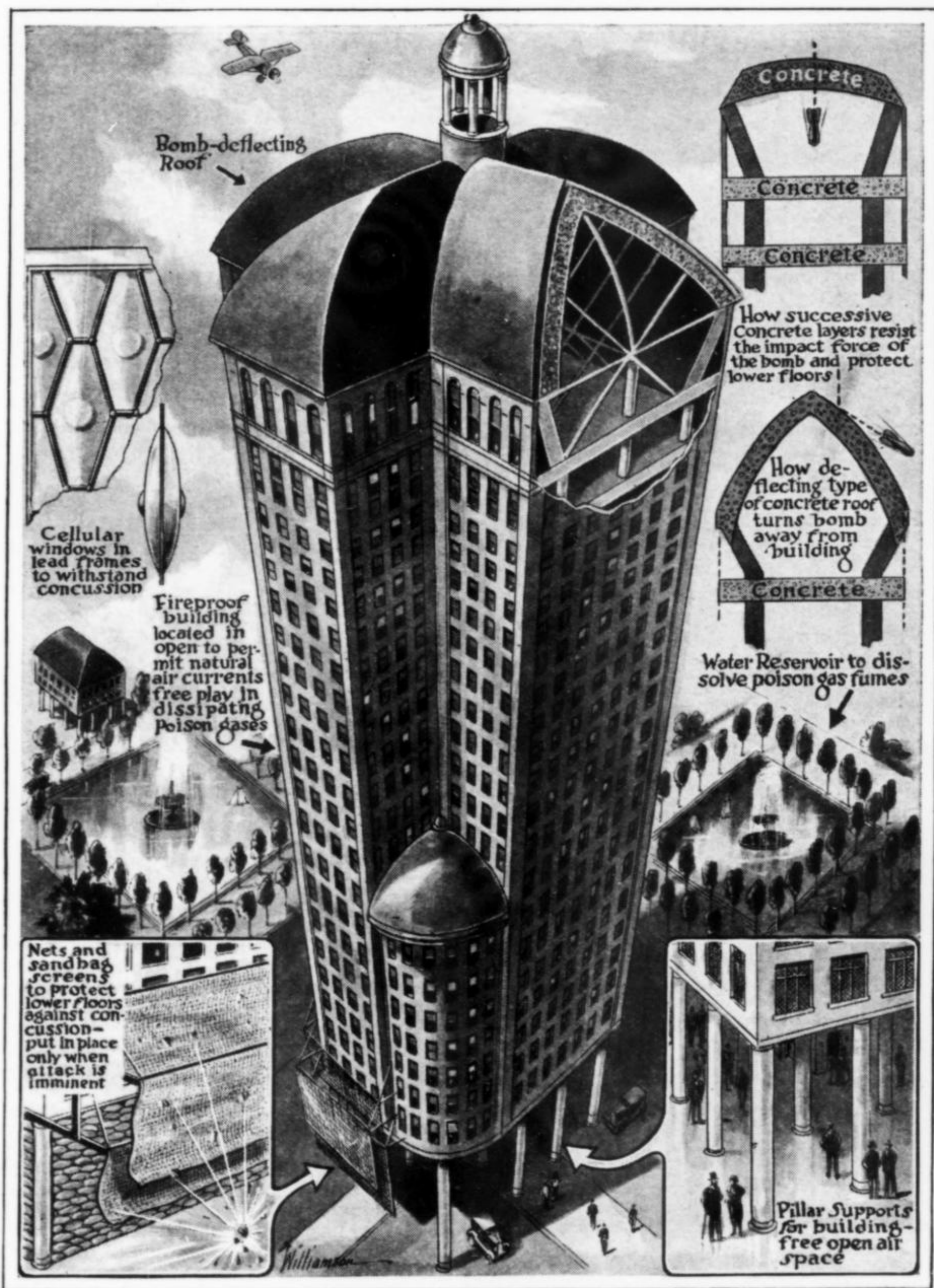


The problem of a balloon's rising into the air or diving into sea depths is substantially the same, as Prof. Piccard points out—a matter of delicately adjusting ballast and lifting elements (gas in the case of air flights, oil in ocean dives) to the medium in which the journey is made. Extreme care necessary in adjusting ballast is shown in photo in which Piccard is weighing himself in with stratosphere balloon ballast. Top picture shows balloon gondola, same type as would be used for submarine work. The gondola is some 6 feet in diameter as compared with 4½ feet in case of Beebe Bathysphere.

Paddlewheel PLANE Latest in Aviation



New Ideas in Bombproof Buildings



European nations are much exercised over the possibility that future wars will result in the utter destruction of large cities through the medium of air bombs. To prevent such catastrophes, a new protective style of architecture has been proposed by a French expert, M. Paul Vauthier, incorporating features shown in the above drawing. It is interesting to note that his suggestions include the idea of supporting floors by longitudinal steel girders rather than by the wall (not shown in drawing)—a feature of American skyscraper construction so familiar that it has become quite commonplace in this country.

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HE BROKE THE
FAST-TO-COAST
MOTORCYCLE
RECORD!



ST. LOUIS
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*Your
job-*
AVIATION

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68

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APRIL
1940

Volume XXIII
Number 6

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THERE'S GOING to be a revolution!

Yes, it's right around the corner, and it's the biggest thing that's hit the radio industry since vacuum tubes replaced crystals and loud speakers sent most of the headsets into the discard.

This new phase of radio is disguising itself under the technical sounding title of "frequency modulation." What it means is static free reception with the finest tone quality yet known. Read the inside story of radio's coming revolution in the May issue of MI!

Don Cooley continues his survey of aviation as it applies to you, and there will be the usual assortment of interesting articles, news shorts, and how-to-build items.

The new **MECHANIX ILLUSTRATED** is on sale at all newsstands the first of every month.

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TOMORROW'S ROCKETSHIP?



ARTISTS' conception of a large passenger rocket as suggested by recent developments in the rocket field and by recent patents issued covering the storing of fuel and improved control methods.

The rocket ship shown is made in two sections—the aft, streamlined section being articulated so that the blast may be directed

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The Atom Takes a Beating!

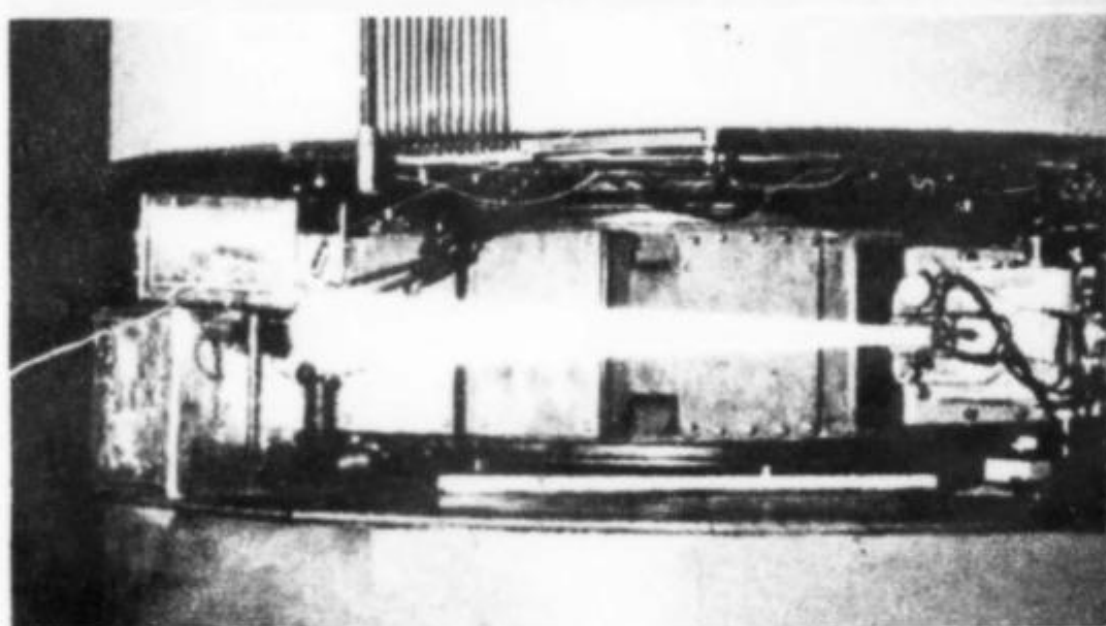
THE most powerful atom smasher ever conceived by the mind of man, that would dwarf present similar devices 10 or 15 times and whose huge electromagnet alone would weigh between 4,000,000 and 6,000,000 pounds, is the new project on which Prof. Ernest Orlando Lawrence, newest Nobel Prize winner in physics, is now hard at work.

This device is an enormous cyclotron that would create atomic particles 50 times as potent as those from radium and which would permit a frontal attack on a colossal scale against the nuclei of the atoms.

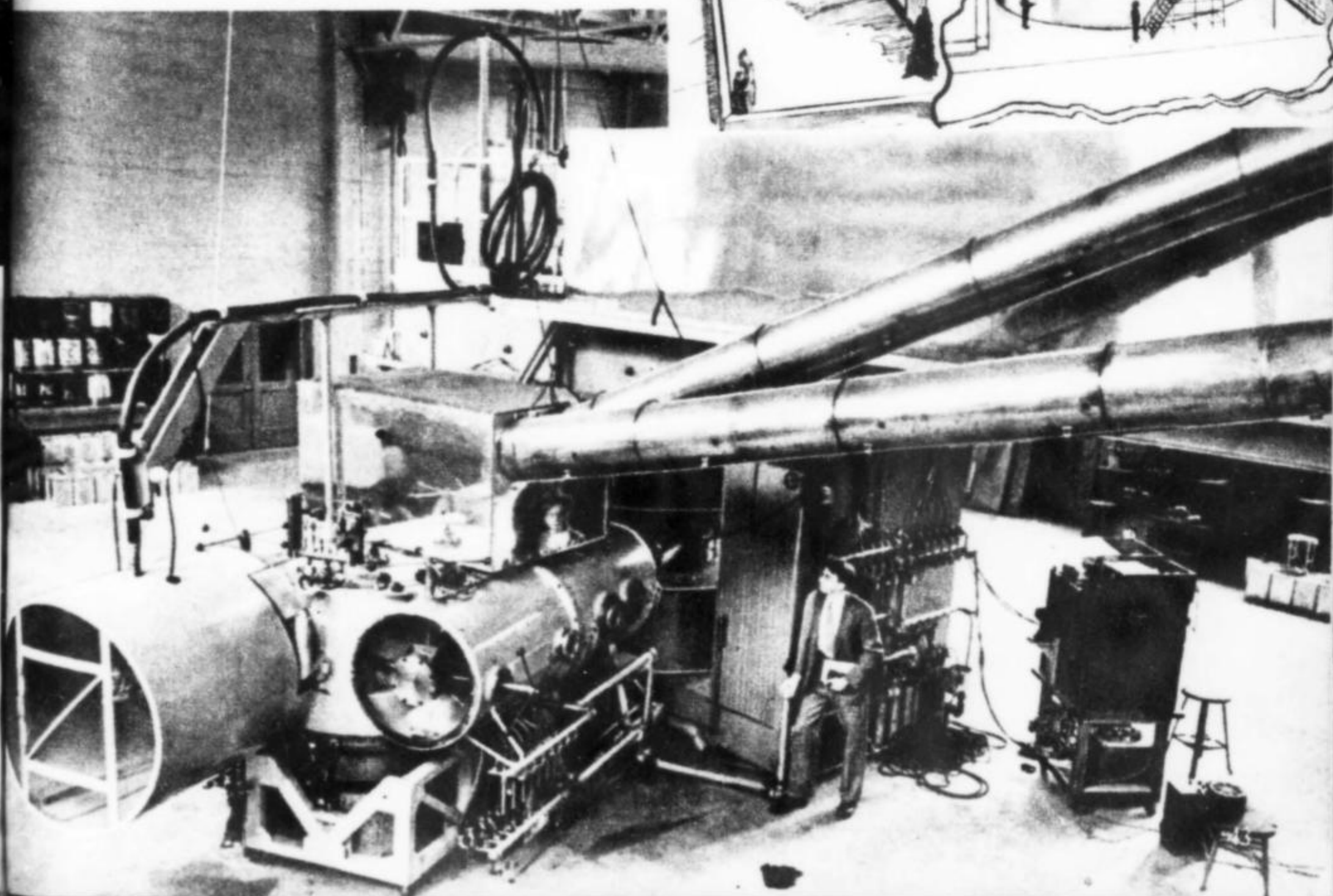
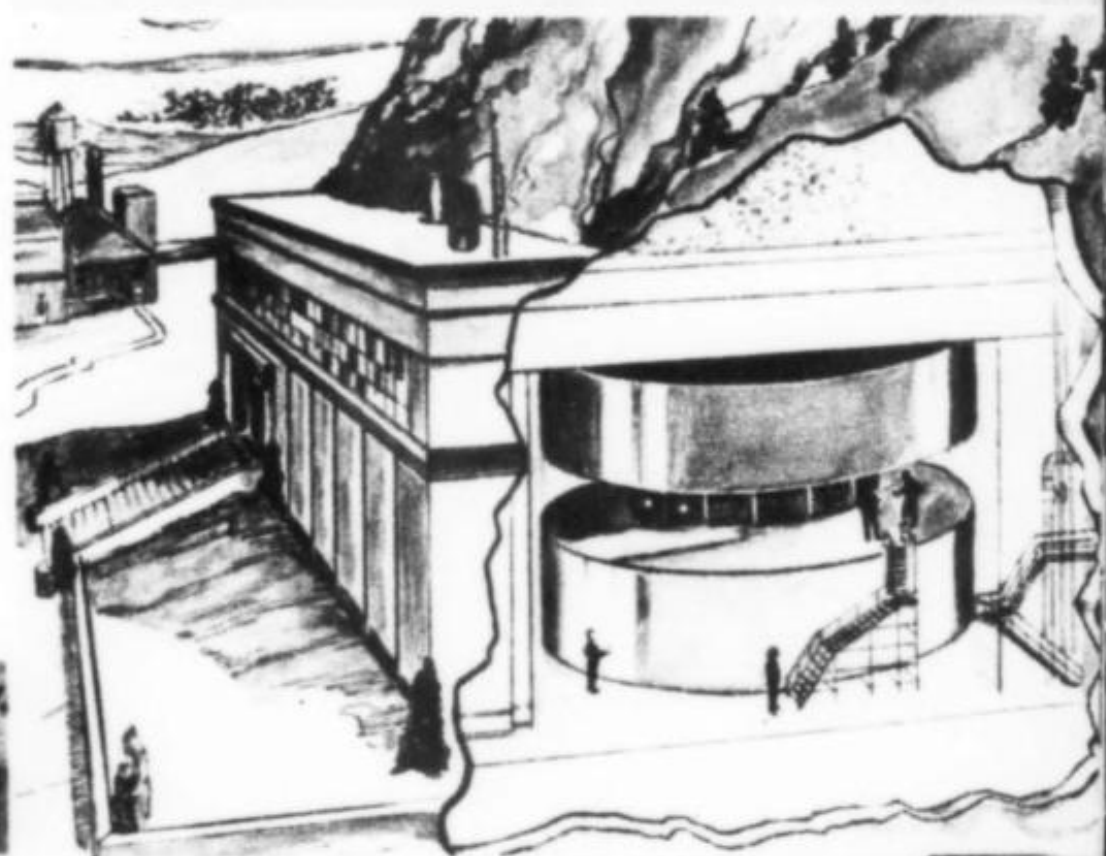
The penetration of the secrets of the mysterious cosmic rays by literally creating them, to some degree, in the laboratory, the possibility of the production of practical atomic power and the transmutation of the elements of the kind that ancient alchemists dreamed about; all these are among the potentialities of the enormous cyclotron which Prof. Lawrence now seeks to build.

The youthful University of California
[Continued on page 117]

Below is the world's largest and newest cyclotron, the 200-ton giant of the University of California, showing the vacuum chambers down which the atomic particles are speeded, with energy as great as 32,000,000 electron volts, after they have been accelerated in great spirals in the cyclotron proper.



The most powerful beam of energy ever created by man, the 16,500,000 electron volt deuteron beam from the University of California cyclotron. Below: Artists conception of the hillside laboratory which would house the huge 3,000-ton cyclotron proposed by Professor Lawrence.

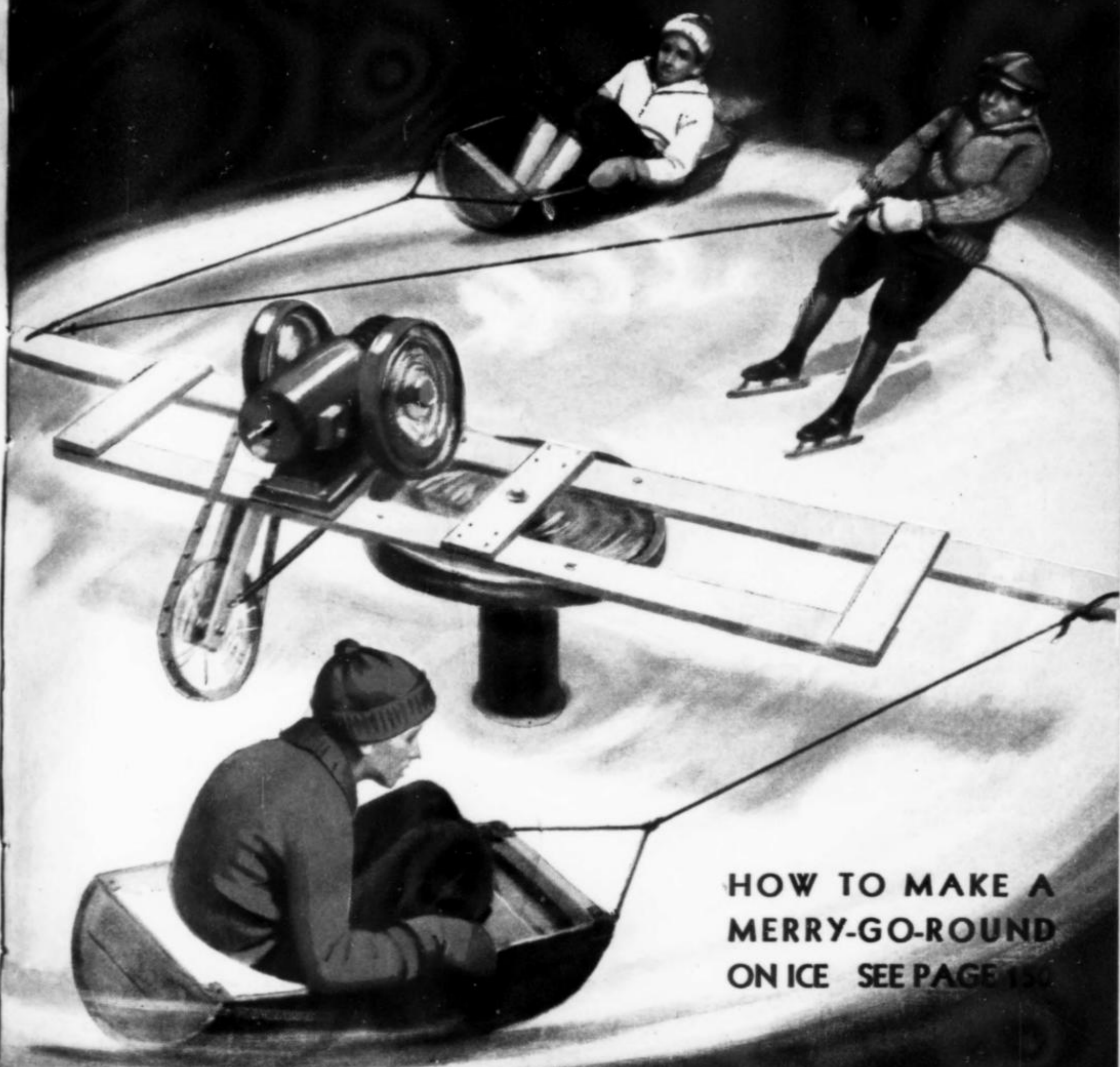


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MODERN MECHANICS

AND INVENTIONS



HOW TO MAKE A
MERRY-GO-ROUND
ON ICE SEE PAGE 150

MAKING MAGIC for MAGICIANS

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HIGH SPOTS IN THIS ISSUE

Do you want your hidden powers
and talents revealed to you? If so,
turn to page 99 and see our offer
of a free handwriting analysis.
Plans for the M-M secondary glider
begin in this issue, while on
page 121 you will learn how to
obtain your glider pilot's license.
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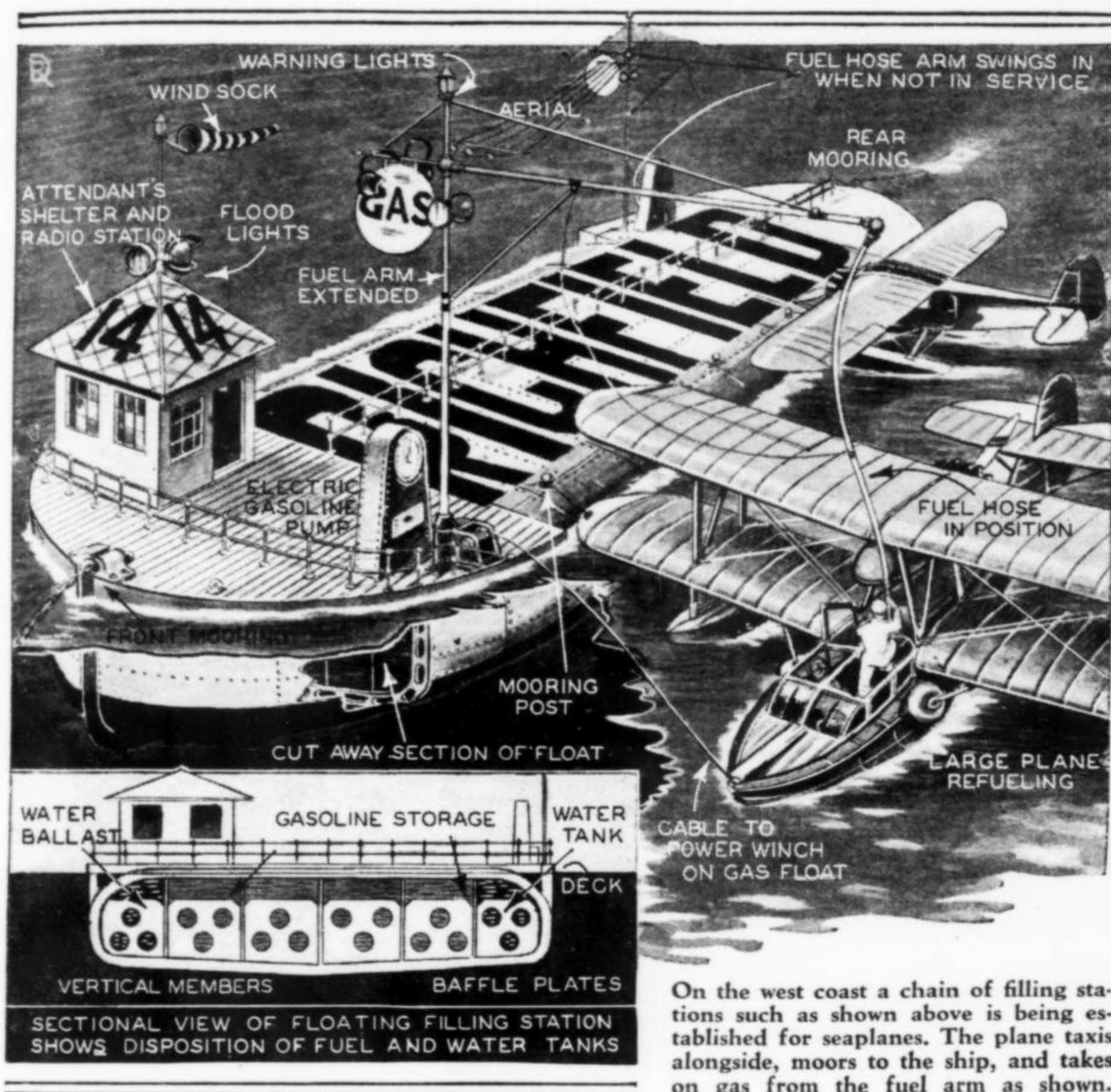
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Floating Fuel Station for SEAPLANES



On the west coast a chain of filling stations such as shown above is being established for seaplanes. The plane taxis alongside, moors to the ship, and takes on gas from the fuel arm as shown.

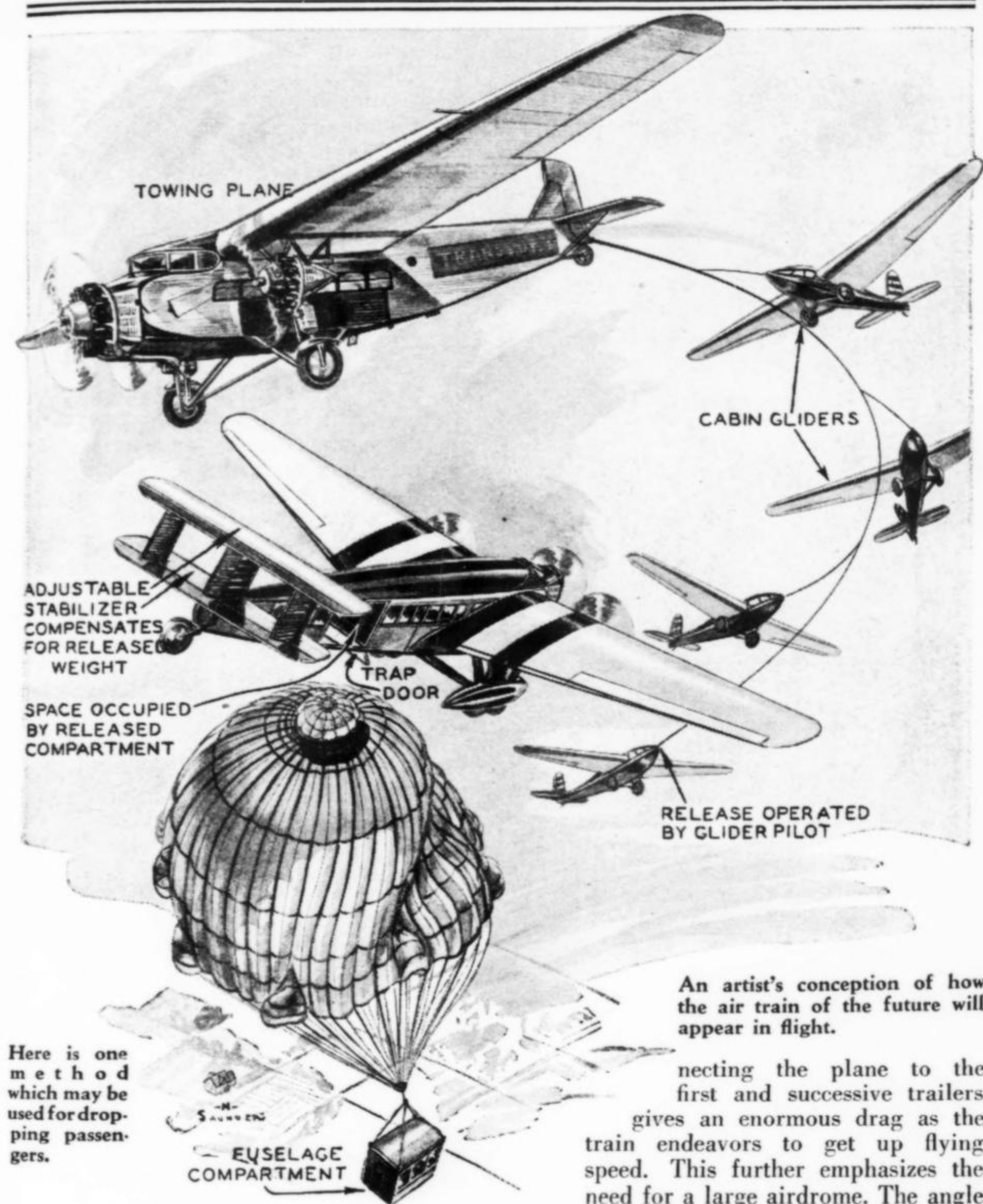
IN THE future, when airplane travel comes to be as commonplace as automobile travel, we may expect to see floating filling stations, such as shown in the drawing above, dotting the airplane travel lanes of the Atlantic and Pacific oceans. This is by no means a fantastic project of dreamers, for already just such floating service stations are to be seen scattered along the Pacific coast; and a west coast oil company, looking to the future, has announced its intentions of establishing a chain of 99 such stations for the accommodation of planes journeying up and down the seaboard.

These floating service stations are marked by neon lighted towers and are equipped to service a plane in any way necessary, their

chief function, however, being refueling. A wireless transmitter and receiver keeps the station in constant communication with land, so that weather information and emergency orders can be provided for the pilots. When a pilot wants to take on fuel he brings his ship up alongside the barge, fastens his mooring lines to the mooring post, and swings the hose, which is attached to the projecting fuel arm, into position and signals to the attendant to begin pumping.

The barge is moored in place by means of anchors. All fuel tanks are below decks, with no projection above save for the office at the stern. The fueling pumps are sunk in pits to safeguard the wings of planes moored alongside.

Two Likely Methods of Discharging Passengers at Intermediate Stations



Here is one method which may be used for dropping passengers.

aircraft development but passing years change many things.

It is quite easy to picture a towing plane with its trailers taking the air but things look different when plans are made for its accomplishment. The train must of necessity be rather long and thus requires a very large airdrome. The various cables con-

An artist's conception of how the air train of the future will appear in flight.

necting the plane to the first and successive trailers gives an enormous drag as the train endeavors to get up flying speed. This further emphasizes the need for a large airdrome. The angle which the trailers make with the line

of travel differs while running along the ground from that taken when traveling through the air. This could be taken care of by a system of bridles attaching the trailers to a main cable.

The problem becomes simpler when the train is in the air. The pilots of the trailers then have a steady pull to take care of.

SCIENCE *Still Seeks a*

by

RAYMOND HULBERT

A fortune awaits the inventor of a rain-making machine which really works. Science says there's nothing impossible about such a machine. Last summer's drouth emphasizes the economic value of a mechanism which would produce water for growing crops when needed.

SCIENCE does not proscribe rain-makers. It does not commit itself on the subject of artificial rain. Science does not say anything is impossible. But during the past century, science has shot dark clouds through the lives of men who professed to possess the talents and the instruments to cause rain to fall from the heavens.

There are incidents noted where some scientists, or perhaps a pseudo-scientist, actually succeeded in making rain fall while the skies were under the spell and influence of his apparatus. The slightest atom of a doubt persisted, however, on these occasions and therefore these inventors have never been honored with bona-fide glory. Their feats have been ascribed to the quirks of chance and coincidence.

On the other hand, engineers and scientists have not utterly abandoned their efforts to produce a machine which will manufacture rain. The drought of last summer, which was grimly devastating in the Corn Belt and other agricultural regions, revealed the golden prospects awaiting the inventor of a practical machine for rain-storms.

The latest episode where a scientist tried to bring rain out of a clear sky occurred at



Dr. G. A. I. M. Sykes with part of his electrical equipment which failed to produce rain in a crisis.

the famous Belmont Race Track during the middle of last September. Dr. G. A. I. M. Sykes installed a shed and his bizarre electrical apparatus in the vicinity of the eighth pole at the track and told the world that he would turn on the rain whenever it pleased his whims.

But before Dr. Sykes announced there was going to be rain, he came out and told Joseph E. Widener, head of the race-track association, that he would have fair weather every day of a certain week. That Dr. Sykes' weather control apparatus would keep the sun shined up like a new penny, as he put it.

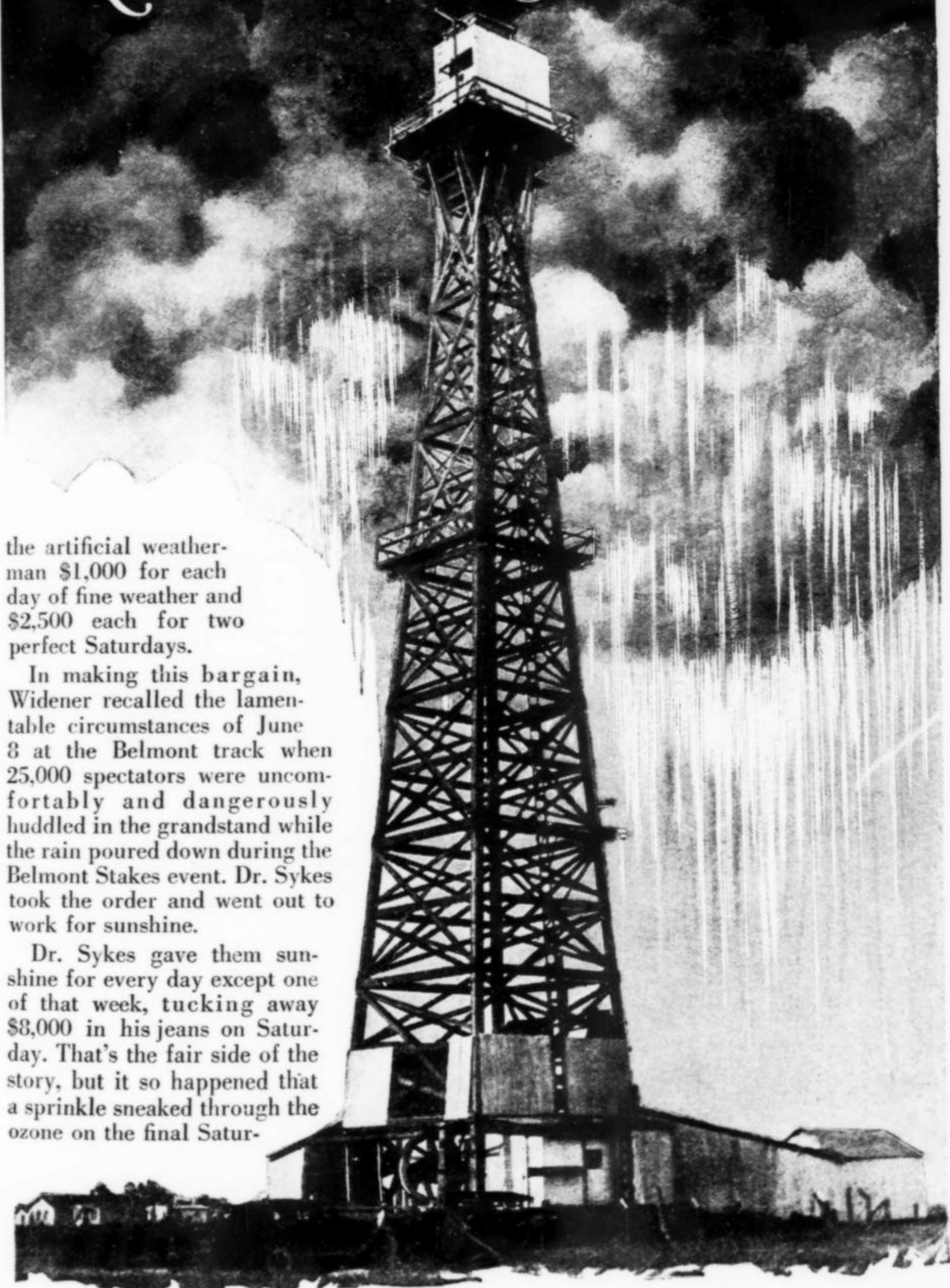
When the skeptics hissed and hooted, Dr. Sykes drew forth a roll of thousand-dollar bills and asserted that he would pay a penalty of \$2,000 for each day it rained against his will. Joe Widener, owner of a fine stable of horses and a sportsman to the core, offered

Rain-Making Machine

the artificial weatherman \$1,000 for each day of fine weather and \$2,500 each for two perfect Saturdays.

In making this bargain, Widener recalled the lamentable circumstances of June 8 at the Belmont track when 25,000 spectators were uncomfortably and dangerously huddled in the grandstand while the rain poured down during the Belmont Stakes event. Dr. Sykes took the order and went out to work for sunshine.

Dr. Sykes gave them sunshine for every day except one of that week, tucking away \$8,000 in his jeans on Saturday. That's the fair side of the story, but it so happened that a sprinkle sneaked through the ozone on the final Satur-



Experimenters leased this abandoned oil derrick at Huntingdon, Calif., and erected a Tesla coil in the tower at the top, to produce rain by the discharge of high tension currents. The effort was unsuccessful.

FAWCETT'S

1917/18

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MODERN MECHANICS AND INVENTIONS

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THE WHEELS

MECHANICS OF
LION TAMING

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PLANE FOR \$500

A BULLET PROOF
ROTOR PLANE
SEE PAGE 95

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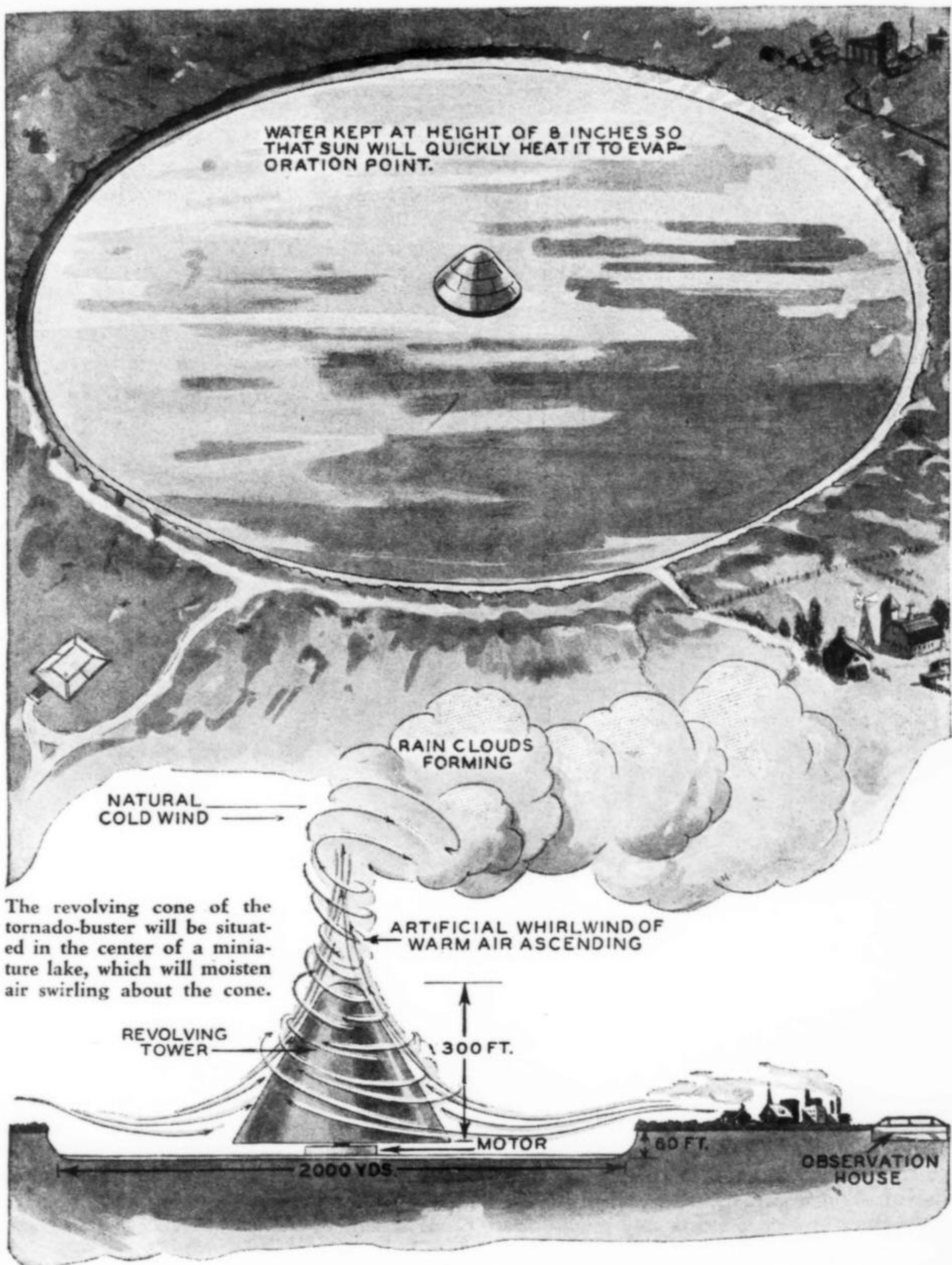
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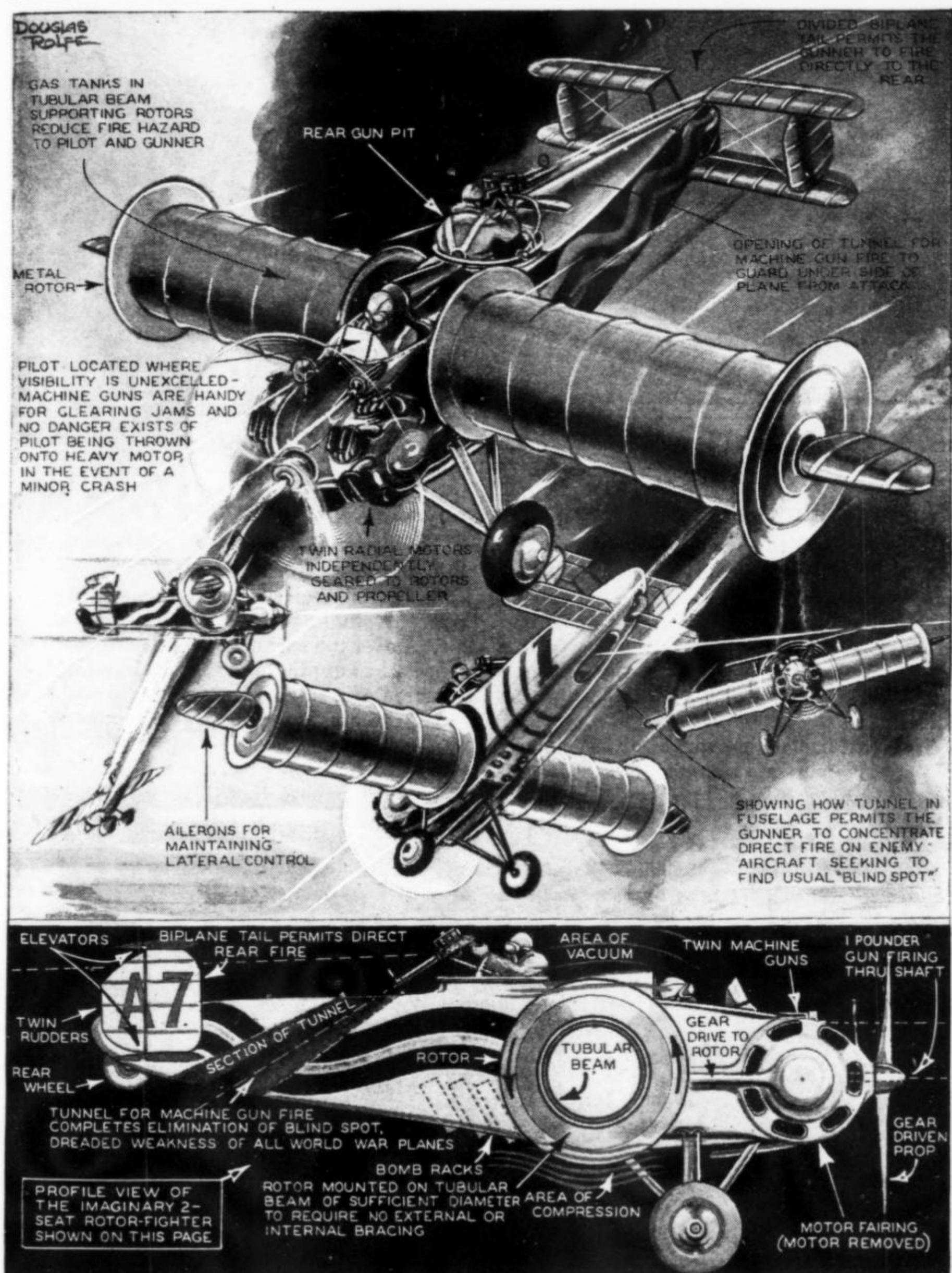
"A Tornado BUSTER" for the Mid-West



The revolving cone of the tornado-buster will be situated in the center of a miniature lake, which will moisten air swirling about the cone.

The above drawing illustrates the scheme proposed by Hans Kutschbach to prevent tornadoes in the Mid-west. This scheme, a modification of a similar project by Dessoliers, a French engineer, calls for the construction of a huge revolving cone that will serve to produce artificial whirlwinds, or potential tornadoes. The moist heated air from the surface of the lake swirls about the cone, then rises to the sky, thus equalizing the atmospheric pressure. The advantage of this scheme lies in the fact that the cone virtually holds the potential tornado stationary, so that it does no damage.

Bullet-Proof All-Metal Rotor Airplanes Being Developed for Future Wars



A few months ago this magazine announced the successful test flights of the first rotor airplane. Several nations are now experimenting with this type of plane for military purposes, and the world may soon see the all-metal rotor-fighter such as is illustrated here. Artist Douglas Rolfe, an expert on aircraft design, shows you how the details of construction of these fighters will probably be worked out.

MODERN MECHANIX

AND INVENTIONS

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A CREWLESS
FREIGHT TRAIN
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S AERIAL WARFARE DOOMED?

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1934

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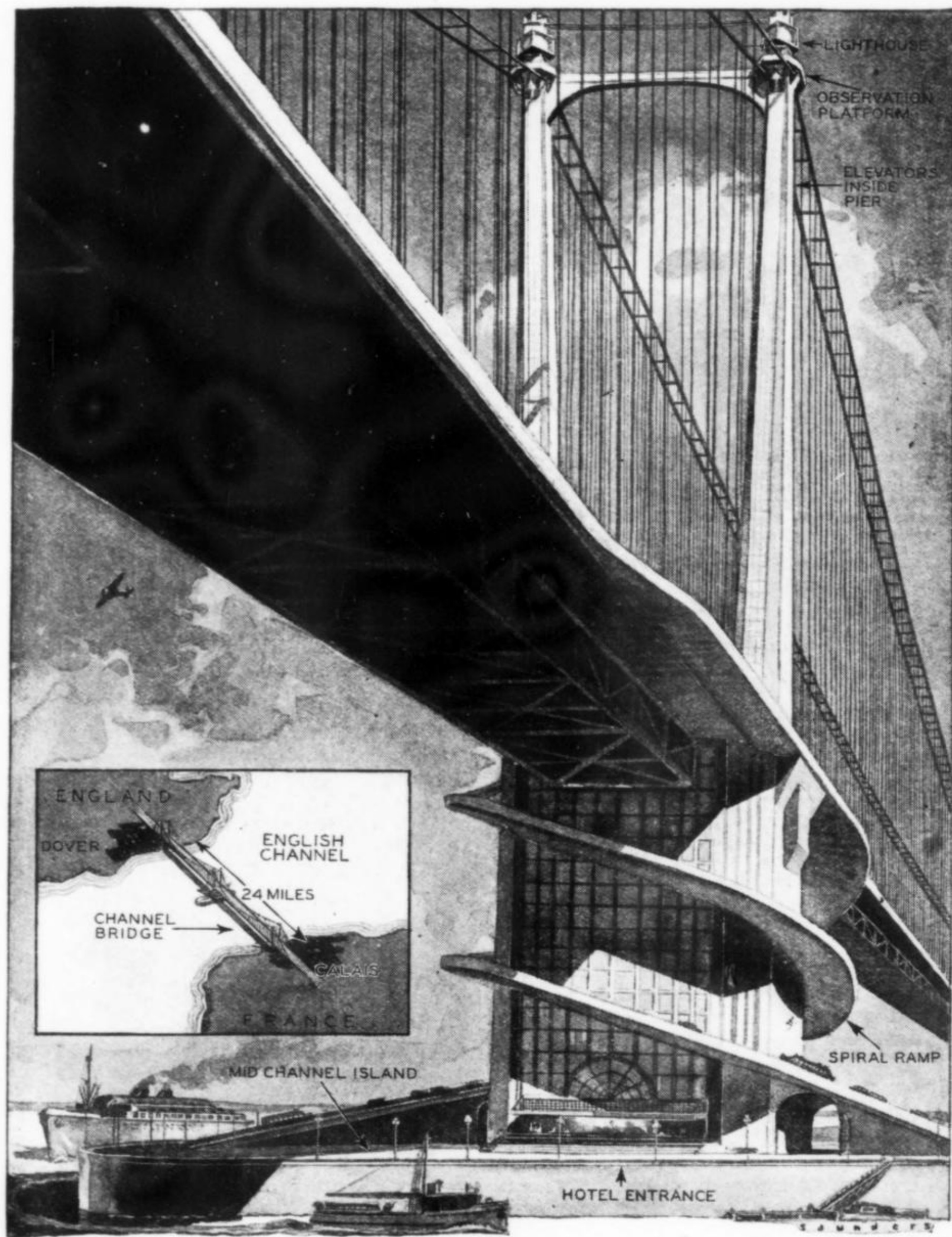
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Giant CHANNEL BRIDGE Planned to Link FRENCH and ENGLISH Coasts



Above is a striking illustration of the huge structure by means of which a Polish engineer proposes to span the English Channel. The bridge would serve as a giant motor highway between France and England and would be of the suspension type, following the general lines of the famous Brooklyn bridge. At the midway point, an island would be built of steel and concrete, serving as a center pier. Cable towers rising from this island could be surmounted by lighthouses to guide steamer traffic and be equipped with observation platforms reached by elevators within the giant towers.

ELECTRIC EYE to Guide CREWLESS Train

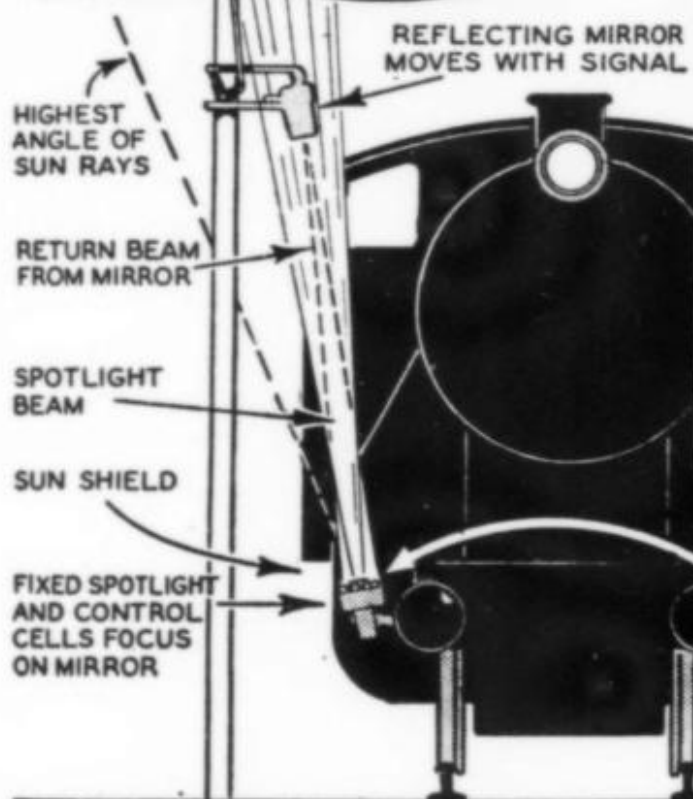
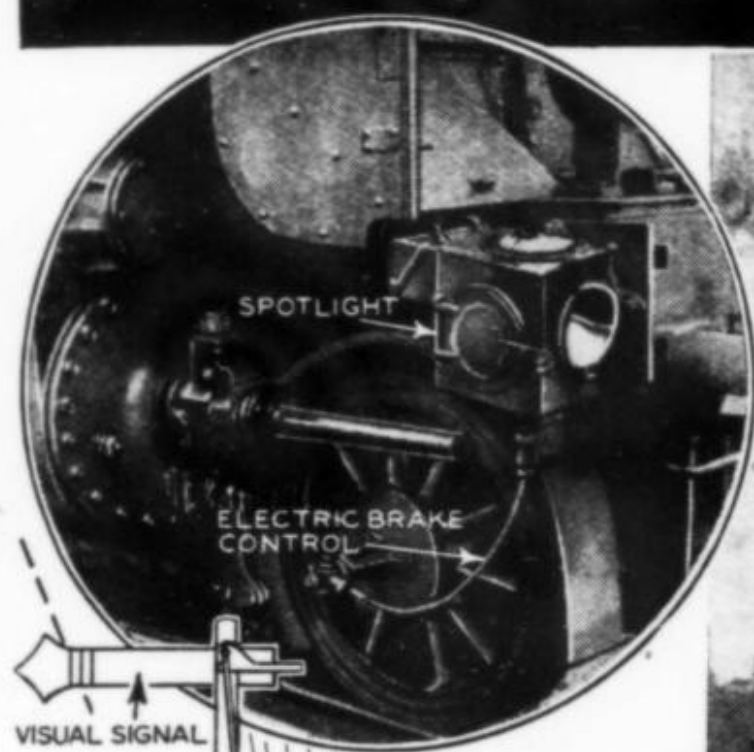
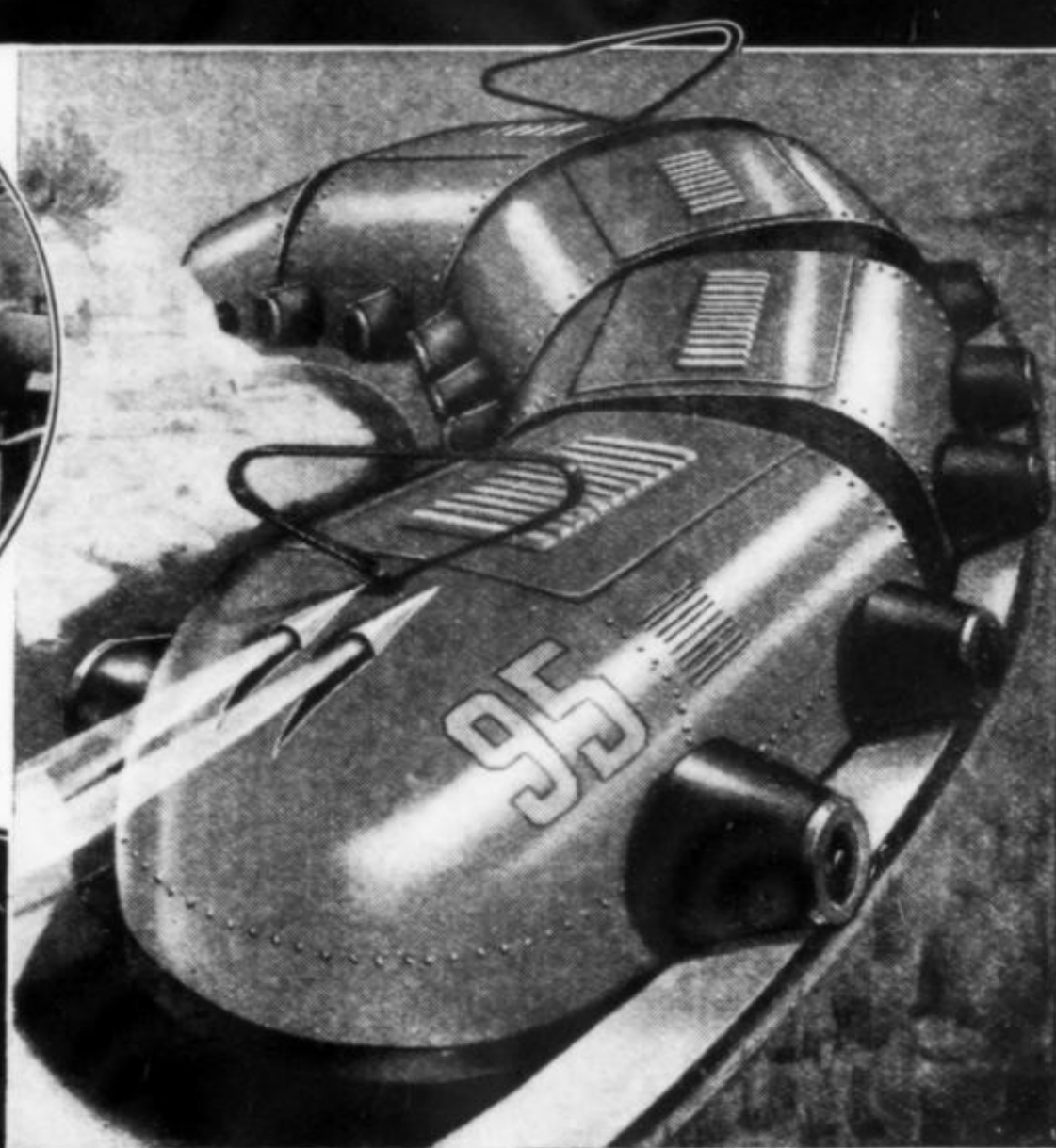


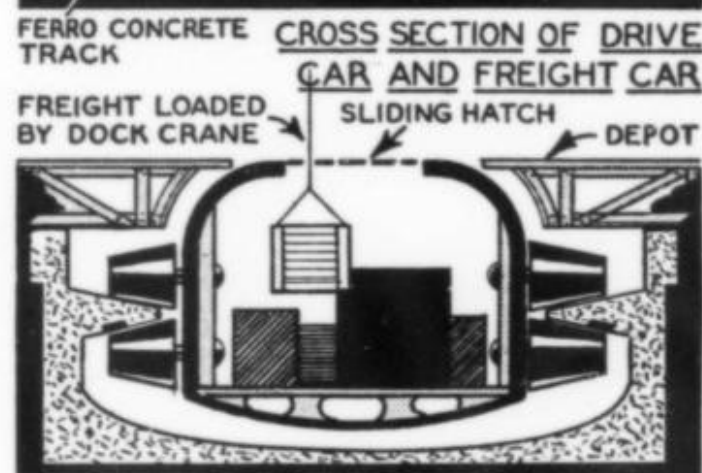
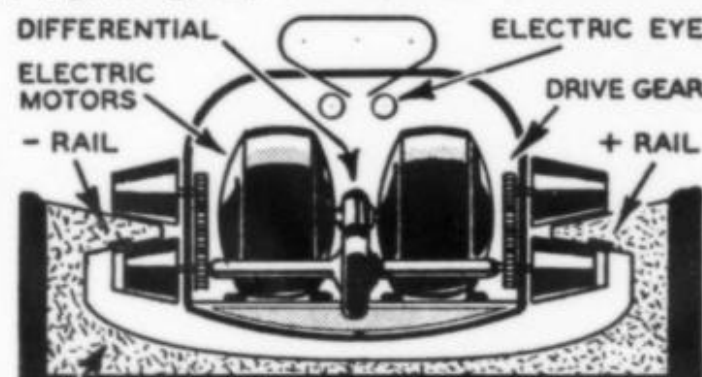
Photo at top shows location of spotlight on electric-eye controlled train in Germany. Drawing above shows how mirror reflects beam to cells around spotlight. The cells are set at an angle so that they will not be hit by sun rays.



With the odd appearance of a caterpillar the radio and electric eye controlled train would run without the aid of a crew. Beams in the front would operate electric eyes. The radio antenna could flash out signals giving the location of the train.



Above at right is a cross section of the power unit of the crewless freight train. The two sets of convex wheels riding above and below the concrete track would eliminate danger of train leaving tracks at high speed. The cars could run into a flush station platform as shown at right for easy loading and unloading.



USE of electric eyes to control trains in Germany may lead to the development of railroad trains requiring no crews. The suggested design calls for a freight train of caterpillar-like series of low, wide trucks with an electric power unit in the lead car. It would operate on special tracks of wedge shape concrete. Imbedded in these are the electric rails which supply current for the motors.

Electric eye beams in the lead car would be used to control the train under normal conditions. These photo-electric signals could slow down the trains at curves and stop them at proper stations.

An experimental electric eye railroad signal is now in use on the Reichsbahnzen-

tralamt of Munich, Germany. It consists of a spotlight mounted on the locomotive that throws a beam upward to a reflecting mirror on the block signal. When the signal is set to stop the train, the mirror reflects the beam to selenium cells which automatically set the brakes.

FIGHTING MILLION DOLLAR OIL WELL FIRES

FEBRUARY

MODERN MECHANIX

FAWCETT PUBLICATION

15^c

Rooms of

**MODERN
MECHANIX**

& INVENTIONS MAGAZINE

FAWCETT BUILDING
GREENWICH, CONN.

Incorking Bottled U. S. Traffic

HOBBS AND INTERNATIONAL

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MODERN MECHANIX

FEBRUARY
1937

Volume XVII
Number 4

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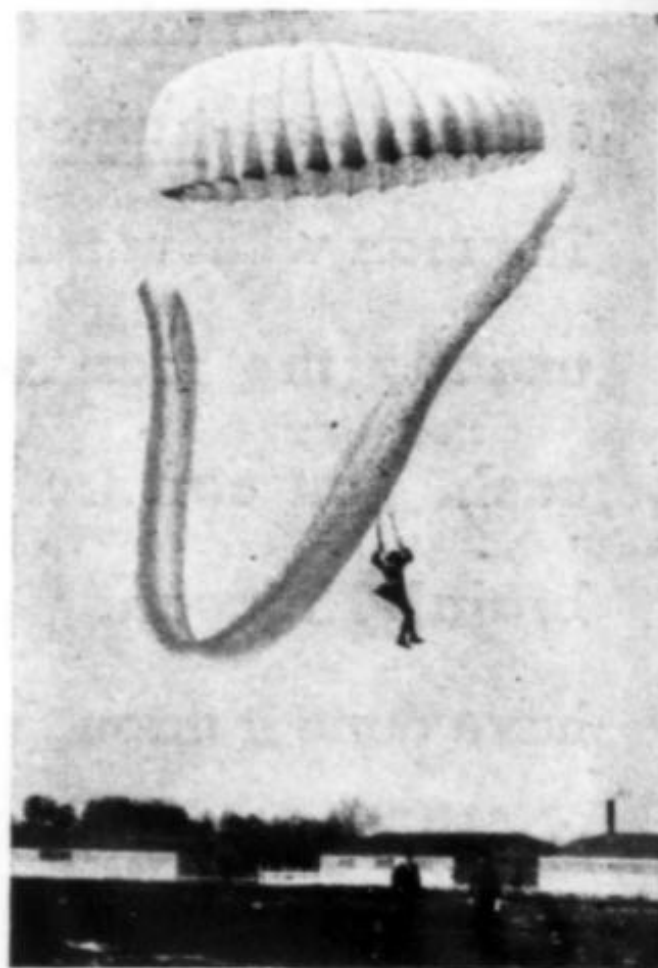
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NEXT MONTH



Pilots throughout the world regard Leslie Irvin as their guardian angel. As a boy, Irvin experimented with crude umbrellas, making jumps from the roofs of neighboring barns. Today, he is known as the "Parachute King" and his factories supply most of the chutes used by airmen of many nations. Irvin was first to foresee the possibilities of equipping regiments of soldiers with chutes and dropping them behind enemy lines, a practice now universally recognized as an important factor in military strategy. Read the fascinating story of Irvin and his part in the development of the parachute in the March issue.

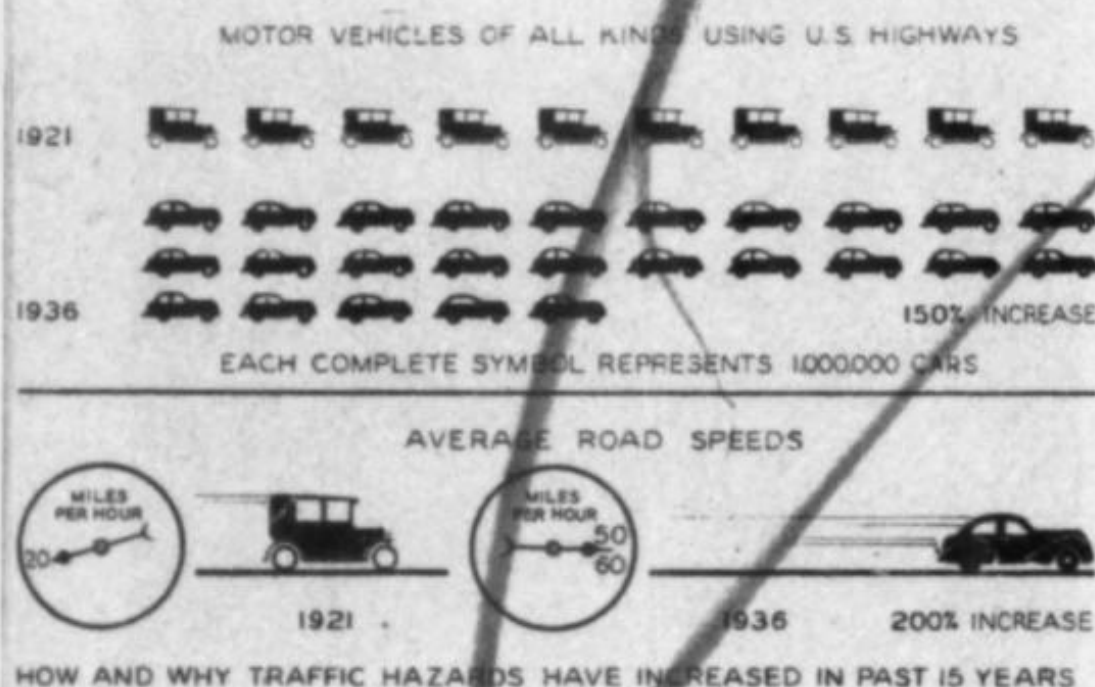
FOR WORKSHOP FANS

Among the many interesting projects included in the March issue will be the first installment of Building Midget Mike, an OO-gauge miniature locomotive, How To Bind Your Own Books, a novel Scotty dog radio, lathe projects, and many other workshop plans, suggestions and time saving kinks.

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Uncorking Bottled T

by Dr. Miller McClintock
Director, Bureau for Street Traffic Research,
Harvard University.



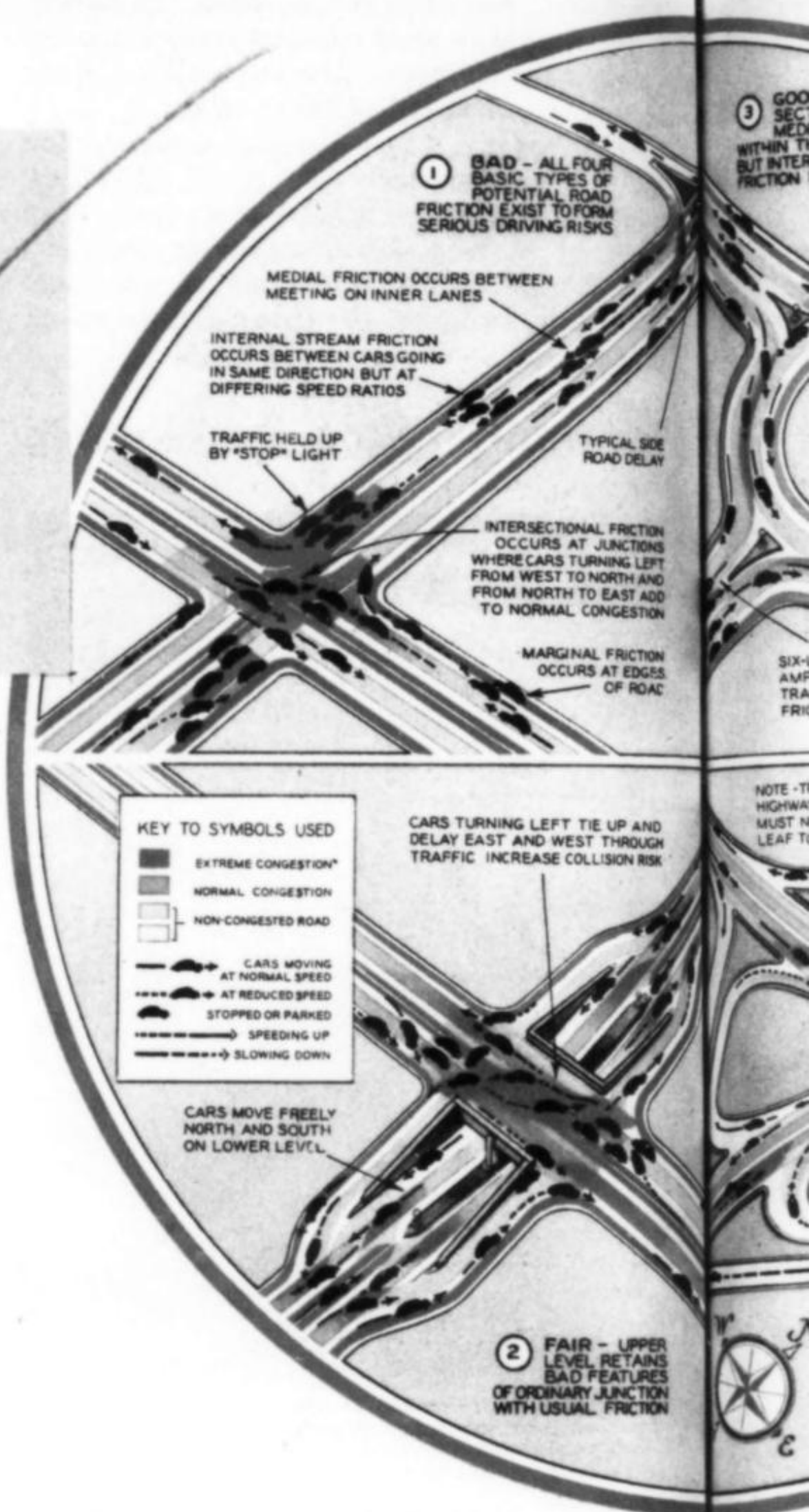
AN IDEA of the problem confronting the traffic engineer may be gained by keeping in mind two contrasting pictures:

Fifteen years ago there were, roughly, 10,000,000 motor vehicles in this country. Today there are two and a half times that number.

Fifteen years ago, and even ten years ago, speed on the road averaged 20 miles an hour. Gradually it went up to 30, then 40, until today speeds of 50 to 60 miles an hour and beyond are considered normal on the open road.

Thus, we have two parallel facts: In the past 15 years the automobile population has increased by 150 per cent, and the rate at which that wheeled population moves along the highways has jumped from 150 to 200 per cent.

As the volume of traffic grew the channels through which it flowed also grew. But they did not grow in a uniform manner, nor as rapidly as the automobile was growing in its speed capabilities. Not that admirable work was not done to have the highway, inherently static, keep pace, as it were, with the faster-developing automobile; the automobile could not have grown in numbers and speed if highways had not developed beyond the horse and buggy stage. But it took money and time to lay the highway network of the United States, by far the most extensive in the world. It has taken even more money and time, once

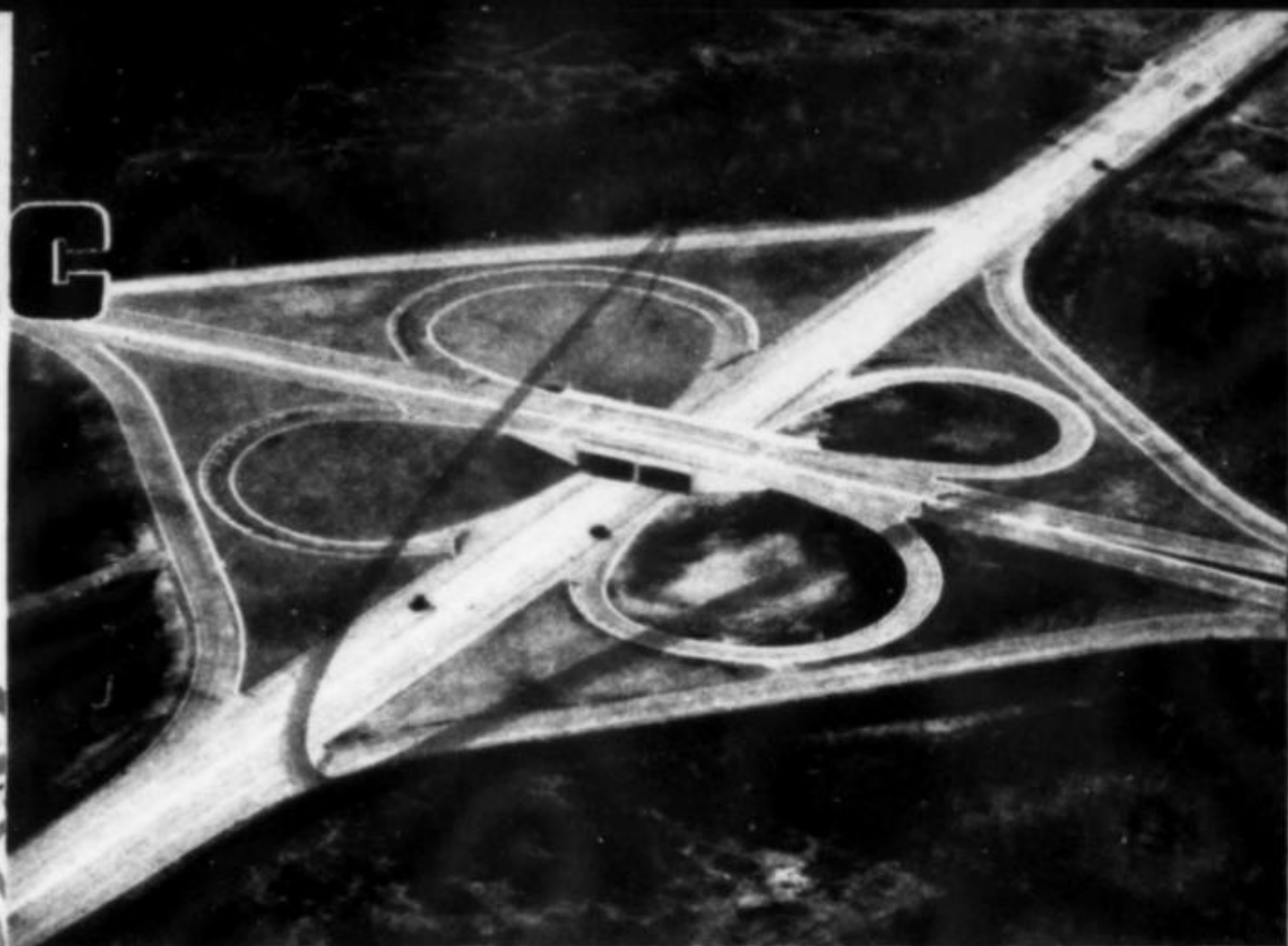
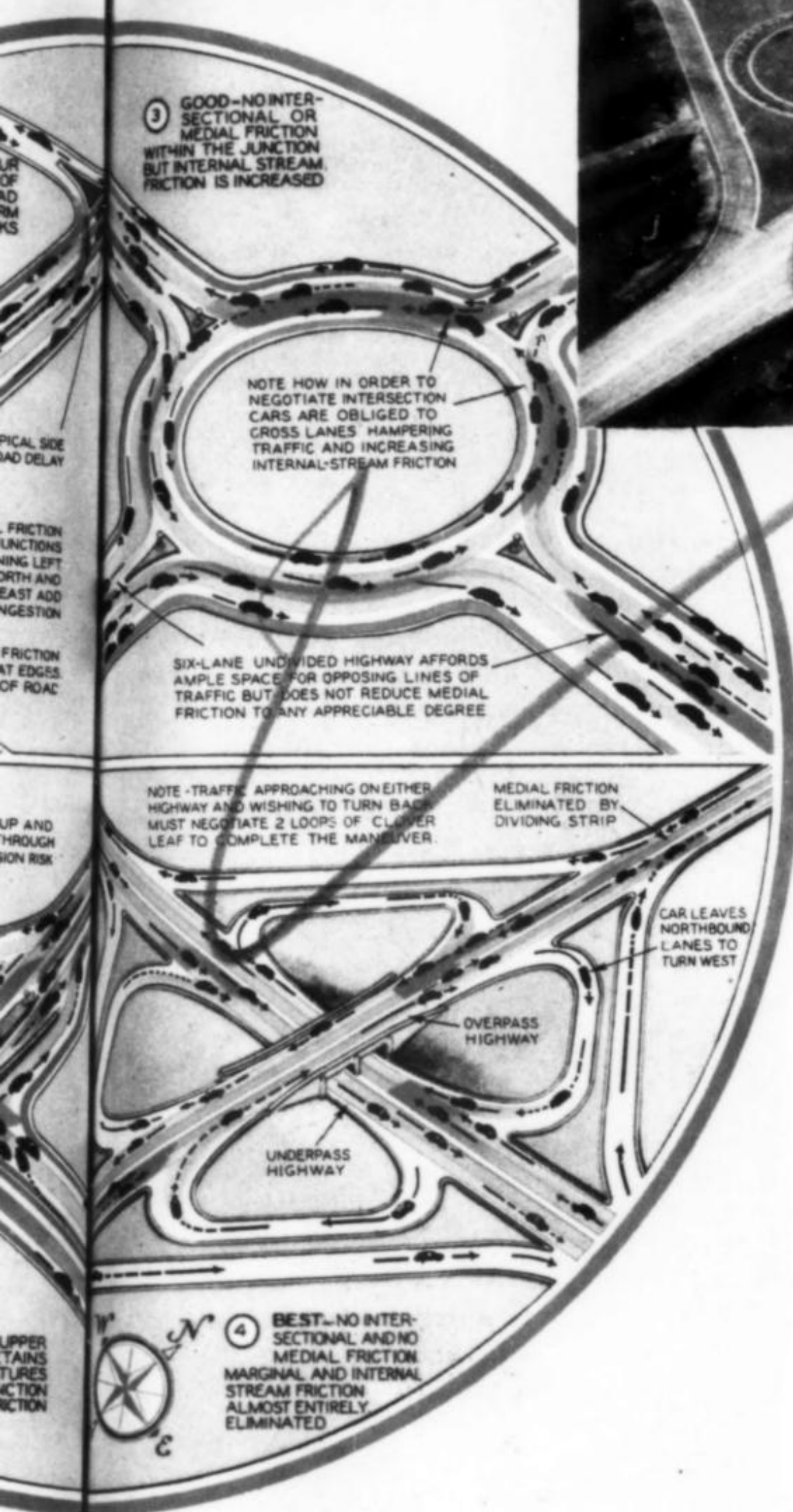


MARGINAL FRICTION involves contact with a person or object on the edge of the road. It leads to such accidents as striking a pedestrian, telegraph pole or parked car, or running into the ditch.

INTERNAL-STREAM FRICTION involves contact between cars moving over a multiple-lane highway in the same direction but at different speeds. It leads to such accidents as side-swiping a car in passing.

Top left quarter of diagram shows traffic at its worst. Lower quarter shows a fair solution, with through traffic on lower road, but dangerous disadvantages of ordinary junction on upper levels.

and Traffic



A "Cloverleaf" type highway at Paramus, N. J., keeps up with automobile age. With super roadways crossing, safety is assured by this Limited Way.

the basic network was finished, to improve the highways to the point where they can accommodate and expedite modern traffic.

While the automobile was being improved, the better to serve as a means of transportation, and the highways were being extended and redesigned, the better to fit the modern car, two things were happening.

The first, of tragic importance, is that more and more persons were meeting death and injury on the highway. In 1913 all deaths by motor vehicles totaled only 4,200. Five years later the number had multiplied by two and one-half times. Nearly 40,000, more than three and one-half times the 1918 figure, were killed last year. In addition, 105,000 others were crippled permanently and more than 1,000,000 injured.

The second was the growing congestion of traffic, particularly in large cities. Congestion impairs the use of the automobile, defeating the very purpose of rapid and free motion for which it was built; it also costs enormously. In New York City alone it has been estimated that delays due to traffic congestion cost motor vehicle owners \$1,000,000 a day. While dire prophesies of a saturation point for automobiles are no more to be taken seriously today than when we had one-third the number of cars (when such prophesies were most loudly uttered), they point to the need for correction. A man will not want to buy an automobile if he cannot make use of it without undue inconvenience and undue risk.

For years everyone has referred to "the stream of traffic"—an inspired popular antici-

Though theoretically traffic flow never ceases in rotary junction (upper right) there is still danger and delay. Cloverleaf juncture of two roads with median strips (lower right) is traffic at its best. There is no congestion, little delay.

MEDIAL FRICTION involves a contact in the middle of the road, as when two cars from opposite directions crash head-on.

INTERSECTIONAL FRICTION involves contact at intersections where streams from different directions come together in the center, forming dams and eddies of traffic. It leads to such accidents as ramming a car in the side and, in addition, to much confusion and delay.



SECTION THRU TYPICAL LIMITED HIGHWAY ILLUSTRATING ITS SAFETY FEATURE

Traffic intersection near Englewood, N. J., which provides through traffic on both upper and lower highways (left).

Below: Germany's magnificent new speedway, between Frankfurt-on-Main and Darmstadt. Note newly planted foliage in center to absorb glaring lights.

pation of what the traffic engineer has come to consider the basic concept of the traffic situation. Traffic moving over a highway has many of the characteristics of water flowing over a river bed, and it obeys similar principles of hydraulics. In other words, as traffic speeds along, turning and twisting and stopping and starting, it encounters four types of friction, as outlined on pages 42 and 43. Analysis of thousands of accidents and near-accidents, and of the elements that create confusion and delay on the road, has shown that all of these traffic hazards and inconveniences fall into one or another of these four kinds of friction.

With these principles in mind, the traffic engineer today not only can diagnose but prescribe for every traffic ill. The Limited Way is the application of these principles. It is a highway designed to move the greatest volume of traffic rapidly and safely.

The Limited Way eliminates medial friction by a raised strip down the center that keeps opposing streams of cars entirely separate. This division of the streams reduces inter-stream friction, since a driver can take his time about passing a car without fear of being struck by an on-coming car. Again, the Limited Way reduces marginal friction by having the edges rounded and raised, so that there is little danger of going off the road; and by a barrier which prevents cars from a side road from cutting into the main stream except gradually. Cars enter the side road from the Limited Way by first going into a deceleration lane at the right.

And, lastly, the Limited Way minimizes intersectional friction by making use of the

clover leaf. The clover leaf represents an evolution similar to that of the straightaway. As traffic volume and the speed of automobiles grew, it became apparent that the simple junction, with the four streams of traffic—two on each road—cutting across one another on the same level did little to prevent confusion, handmaiden of accidents. The cars stopped by the red signal jam together; cars turning left on the green light block the passage of those trying to move with the signal, while



UNIFORMED, ROUNDED
AD SHOULDERS

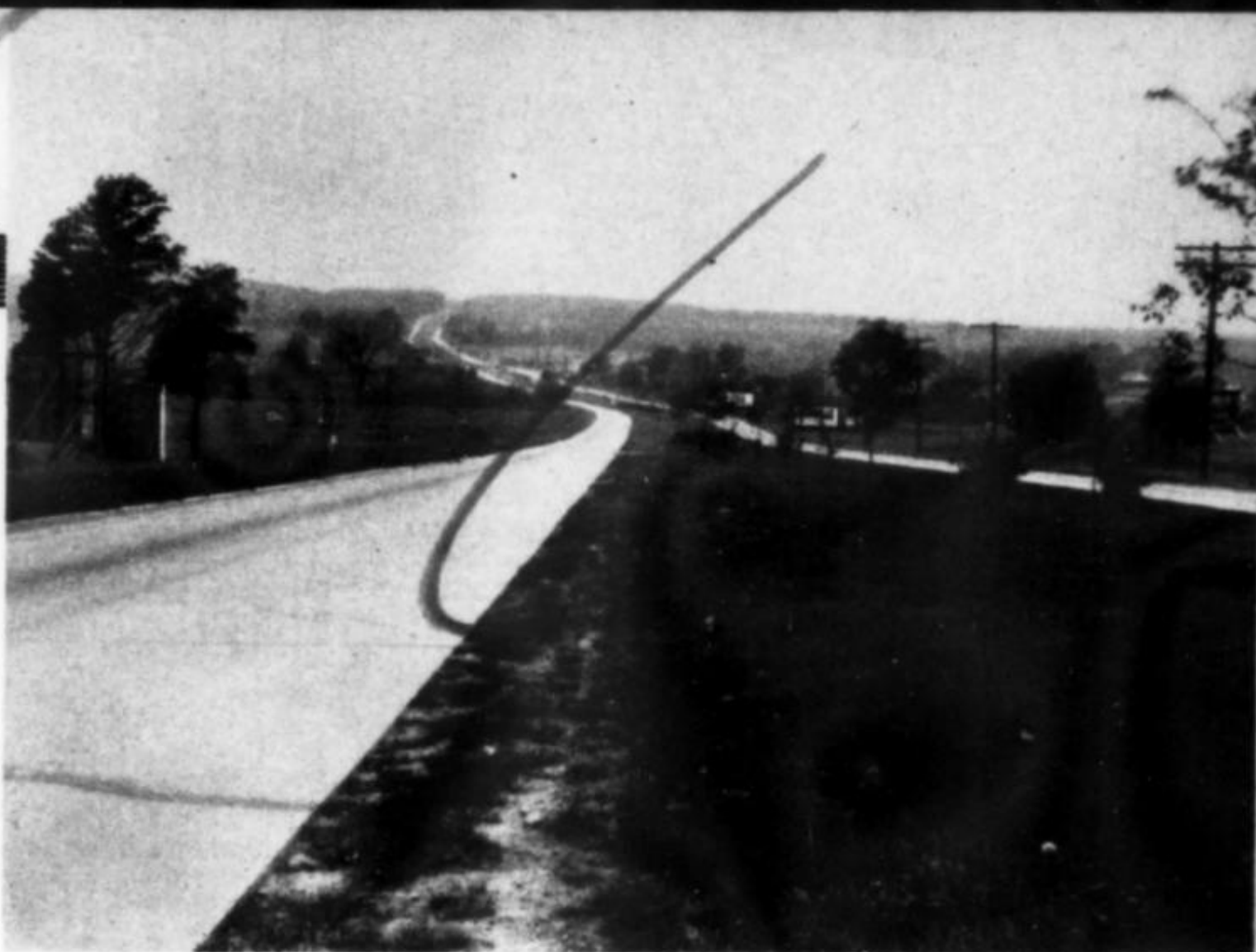
LIMITED HIGH-
WAY FEATURE

FOCUS LEVEL OF AUTOMOBILE HEADLIGHTS

SECTION THRU NEW GERMAN LIMITED
WAY WITH STAGGERED TRAFFIC LANES

An American two-way highway,
winding over hill and dale,
speeds traffic in rural areas
on smooth ribbons of concrete.

Staggered traffic lanes on Ger-
many's Reichsautobahnen be-
tween Munich and Holz-
kirchen. Diagram at lower
right shows how blinding lights
of passing cars are diffused.



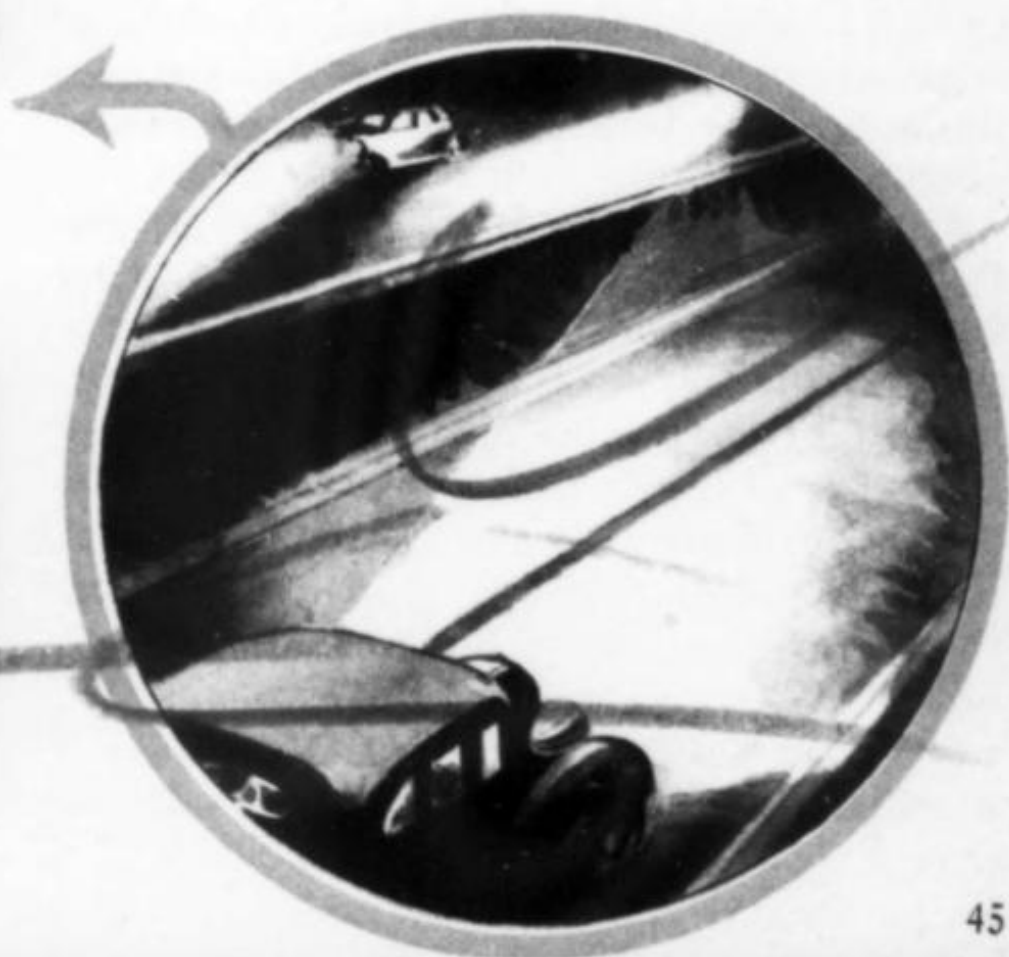
both the left turning cars and the right turn-
ing cars crowd together, jockeying to get
through. The result is often a ram amidships.

By depressing one of the highways at the
intersection some good was accomplished,
for through traffic on the lower level could
proceed right along. But cars emerging from
the lower level onto the upper must squeeze
into the fast moving stream above. Cars on
the upper level, making left turns to reach the
cross highway, must make an even more

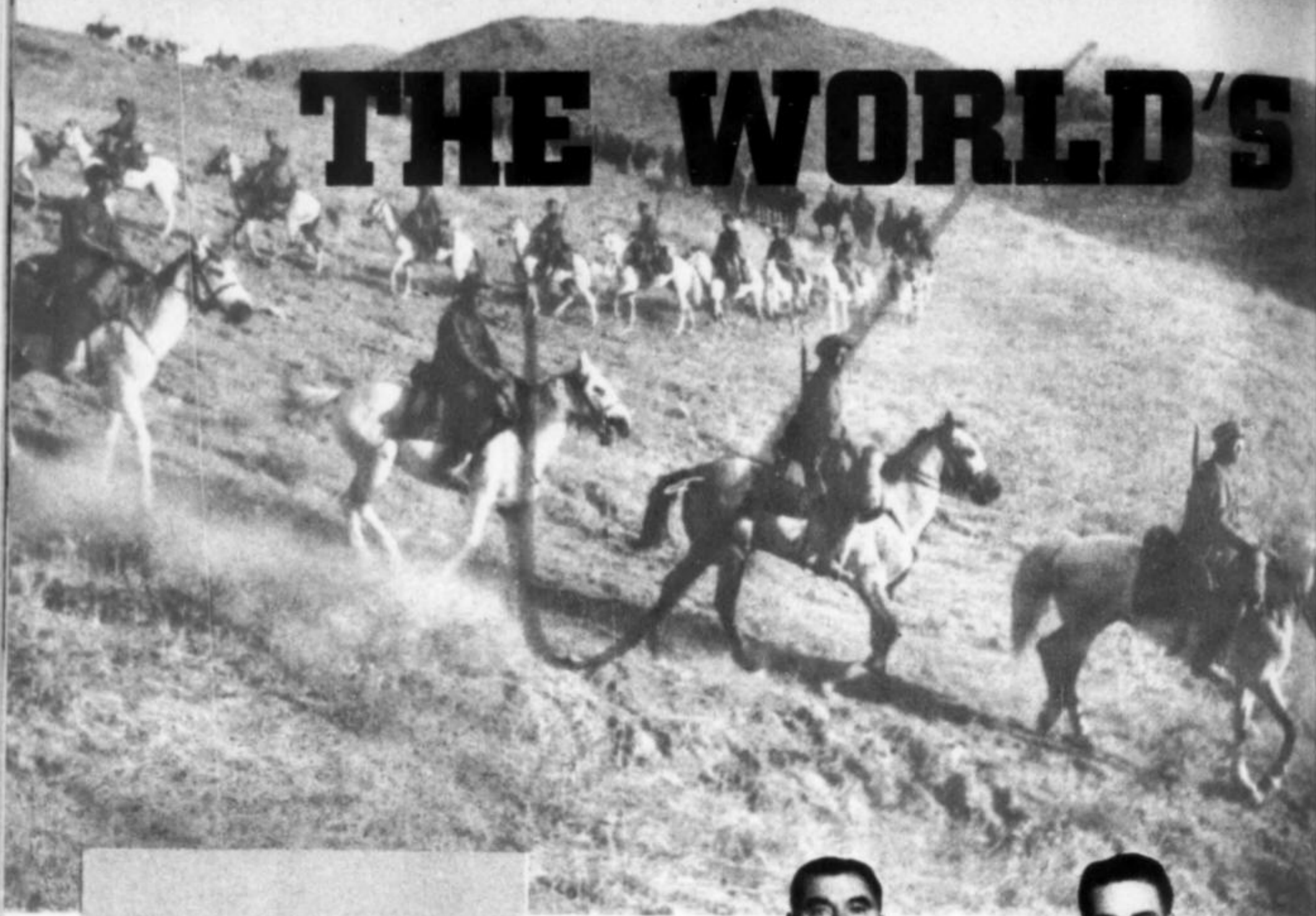
difficult maneuver, dodging both the traffic
behind them and the opposing traffic, and
keeping clear of cars making left turns from
the opposing lane.

The rotary junction is better, for it elimi-
nates the danger of cars approaching at right
angles to each other, from which head-on
crashes occur. Although, in principle, traffic
can move freely around the circle, cars have
to swing from one lane to another. The re-
sult is generally confusion and delay, and
often sideswipes and rear-end smashes.

Virtually all these difficulties and risks dis-
appear with the clover leaf intersection of
the type that New Jersey has pioneered in
building, to take care of the immense traffic
streams created by the Holland Tunnel and
the George Washington Bridge. If the clover
leaf junction is of two highways having a
raised strip in the middle to divide opposing
lines of traffic, then the safest intersection



THE WORLD'S



Facing war on wide fronts from foes in both Europe and Asia, the Soviet has built up the vastest fighting machine of to-day. Here is how it works--and why it might fail.



Brains for the brawn of the mighty Red Army: Seated, (left to right) Tukashevsky, Commissar of Defense, a former aristocrat and slated commander-in-chief in case of war; Voroshilov, Commissar of War; Vegesov, chief of staff. Standing, Budonney, chief of Cavalry, and Bleucher, head of Far East Army. Top photo shows peasant cavalry in mountain maneuvers.

THE chimes in the ancient clock-tower of the Kremlin strike ten. For hours troops have stood in Red Square, shifting their feet for warmth against the cold as they await the arrival of Joseph Stalin and other members of the Communist hierarchy in the reviewing stand atop Lenin's tomb just across the plaza. No sooner have the chimes ceased than Stalin, accompanied by a dozen dignitaries, appears on the parapet.

A black charger, bearing a trim, gray-haired figure in uniform, his sword raised in

salute, dashes into the square, passes the line of rigid troops, now at attention, and, wheeling up before the reviewing stand, salutes the leaders. Four military bands strike up the "Internationale," the Communist anthem.

When the last notes have died on the winter air there comes from thousands of deep

S BIGGEST ARMY

by
Joseph M. Baird

Artillerymen of Workers and Peasants Army spot sky raiders. Soviet war machine is prepared to meet air attacks in both Europe and Asia.

Below—Bow of a bomber. Soviet pilots have reputation for bravery and skill, but experts criticize slowness of planes, call motors inferior.

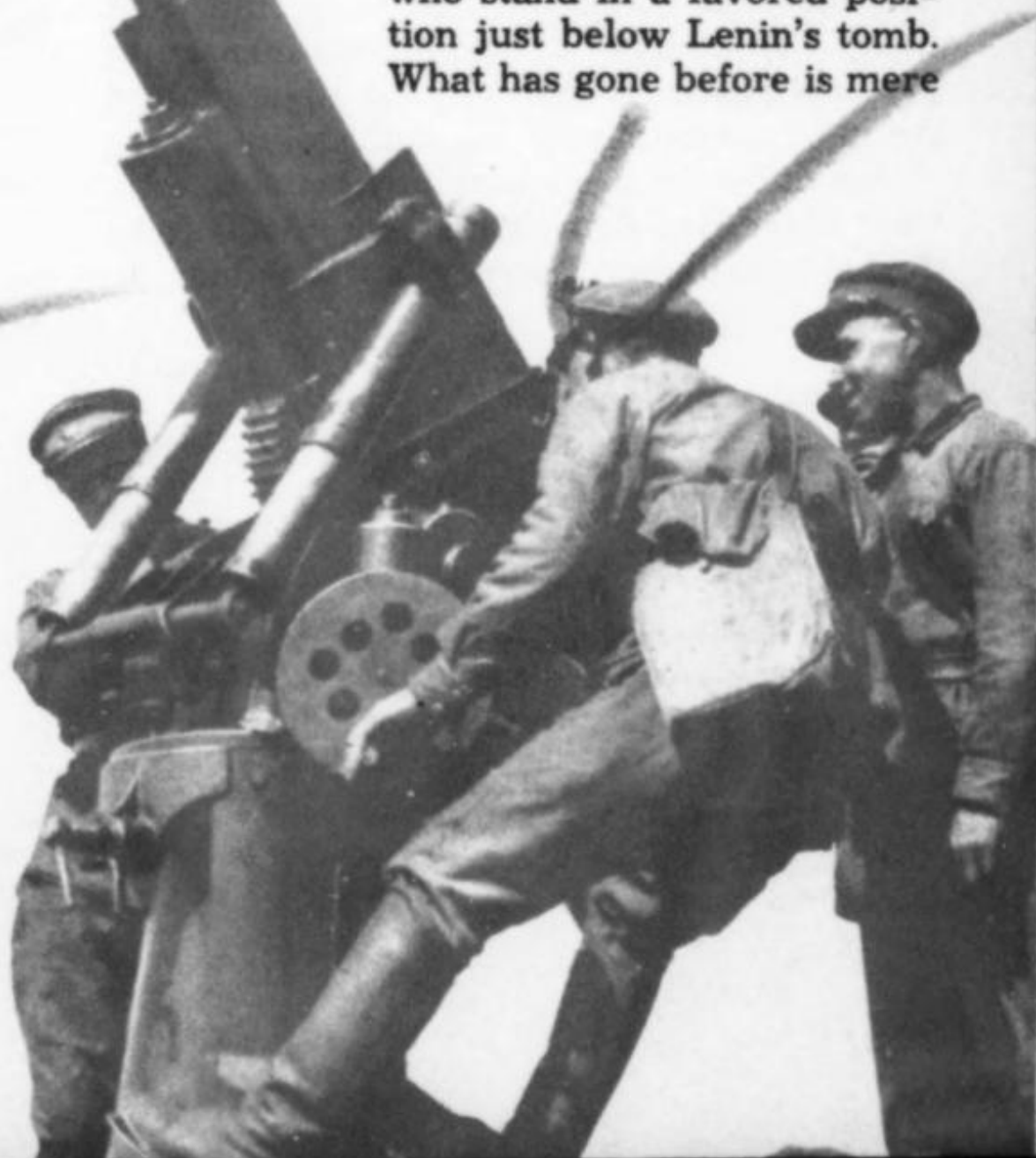
throats an indescribable roar—a shout of challenge and exultation.

The lone rider—Klementi Voroshilov, Commissar of War—wheels his horse and dashes to the other end of Red Square. He is presenting to Stalin and the Politbureau a symbol of the giant military machine the Soviet Union has built from the ragged soldiers who crushed Tsardom.

From the side of the square opposite Voroshilov there emerge the first marching ranks of the Red Army, clad in greenish drab, their peaked woolen caps emblazoned with a red star. First, infantrymen, thousands and thousands of them, marching across the great plaza whose cobble-stones have been soaked with the blood of Russian warriors since the great stone Kremlin was nothing but a rude, log fortress. They pass in waves for at least an hour, their swords and bayonets flashing in the wan wintry sun.

Then comes Budonney's cavalry, whose history is interwoven with the campaign against General Wrangel and the reconquering of the Ukraine from the Poles. Bands play the "Budonney Cavalry March" and the well-trained horses keep time with the grace and precision of ballet dancers.

Now there is a stir among the foreign military attaches who stand in a favored position just below Lenin's tomb. What has gone before is mere



routine to them, for they have seen hundreds of parades. But in the distance sounds the rumble of tanks. How many will there be and of what type? They are keenly interested in the Red Army's mechanization program.

At the last review I witnessed in late 1935 there were about 550 tanks varying in size from the little "whippets" manned by one soldier and carrying only a machine gun, to the mammoths which can crush a stone building and carry a 3-inch cannon. That this number of tanks can be assembled and complete their run through Red Square with only one or two dropping out for repairs attests increasing technical efficiency.

Then comes the artillery, the standard types employed by all powers: Searchlight batteries, aircraft sound detectors, portable wireless—nothing unusual in this.

Again the military attaches show interest. In the distance they hear the hum of planes. For 20 minutes the sky is darkened by a vast armada—attack planes, observation ships, fast, stream-lined "chasseurs"—but only a few—and then several squadrons of giant four-motored bombers, among the largest military planes in the world. In all, nearly 600 fly overhead, a vast demonstration.

But the ability to parade is no criterion of an army's strength. What is the Red Army? How does it compare with the troops of the Tsar? How would it stand the test of war?

As about most things Russian, there is a tendency, even among military men, to go to fanatical extremes in discussing the Red Army. It is either a "formidable menace to the capitalistic world" or "an ill-organized group of peasants with no staff ability."

One difficulty in making any reliable estimate of the Red Army's strength results from the extraordinary secrecy surrounding it.

Mystery is in the very soul of Russia, and it has been intensified under the Soviets by their belief that the whole capitalistic world is their enemy.

Hence it would be presumptuous to attempt here to give more than a general picture, drawn from the Soviet press, two years of residence in Russia and numerous talks with military attaches.

The truth about the Red Army lies somewhere between the two extremist estimates cited. Statistically, it is a standing army of 1,350,000 men, the largest personnel in the world. Its soldiers are recruited on a basis of universal, compulsory military service for two years, except in the technical branches, where enlistment may be for as much as four years. Formerly it was organized on a "territorial" basis—that is, most of its soldiers served in their home districts—but lately it



Training of girls like these in parachute jumping is part of Russia's vast preparedness program. Lower photo shows Army tanks lumbering along village road in war practice. Tanks can also swim rivers.



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No of ever be the Wa Commi those Then t may be

Russ how hi the Kr ary, 1 mechan unit th can an higher armore this eq

This bi limber firing wheels. biggest have h technic man of Beside 1,350, 10,000

has been placed on a "garrison" status, which means that about 75 per cent of the troops are stationed at places of strategic importance.

No official figure for Red Army reserves has ever been announced, but a representative of the War Office told the All-Union Executive Committee recently that reserves equalled those of 1914, just before the World War. Then they totalled 10,000,000 men, and that may be taken as a reliable current figure.

Russia's army is highly mechanized; just how highly no one outside the War Office and the Kremlin knows, but as long ago as January, 1934, Voroshilov boasted that its mechanization was higher per man-power unit than that of either the British or American armies. There may be, of course, a higher percentage of machine guns, tanks and armored cars per man-power unit, without this equipment being equal in quality to that

of some of the other armies. A military attache of one of the large powers with whom I discussed this question asserted positively that the Russian equipment was inferior in quality. However, he added the point that, if Russia had sufficient technical equipment, it could make up in sheer quantity what it lacked in quality.

In the field of aviation close secrecy also is observed, but here it is possible to be somewhat more specific. A strength of 7,000 planes was announced in November. A figure near that is generally accepted by foreign military attaches in Moscow.

Russian pilots have a reputation for bravery, skill, quick-thinking and prompt nervous reflexes—the qualities of an excellent flier. But, in the opinion of foreign military men, the material of the Russian air force is considerably inferior to that of Germany, Italy, Great Britain and the United States. Indeed, Voroshilov has publicly admitted that the great weakness of the air force is the inferior quality of its motors. Russia has imported some foreign engines, but manufactures nothing comparable to the 1,250-horsepower giants which drive the latest types of American military planes.

The Soviet state, probably because of the threat of prompt retaliation by air which it wants to hold over Japan to discourage that country from invading Siberia, has placed great emphasis on heavy bombers. I have seen in the air at one time as many as three squadrons of these giant, four-motored ships with a tremendous bomb carrying capacity, and they came from a single field in European Russia. It is understood that most of them are stationed in the Far East, in the area around Vladivostok. They are capable of

[Continued on page 138]



Red soldiers man a machine gun in forest. The best dressed of all the Russians, snow and freezing weather fail to faze them on their icy battlefields.

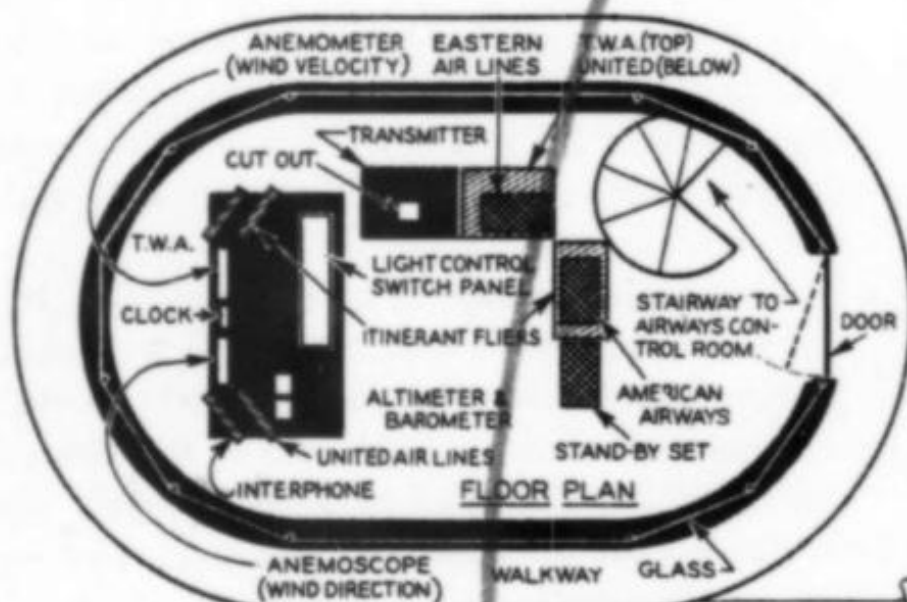


This big gun is easy to unlimber as it lumbers up to firing line on caterpillar wheels. The Red Army, biggest in world, is said to have highest percentage of technical equipment per man of any fighting force. Besides standing army of 1,350,000 men, there are 10,000,000 in reserve.

"Hello; Newark—"

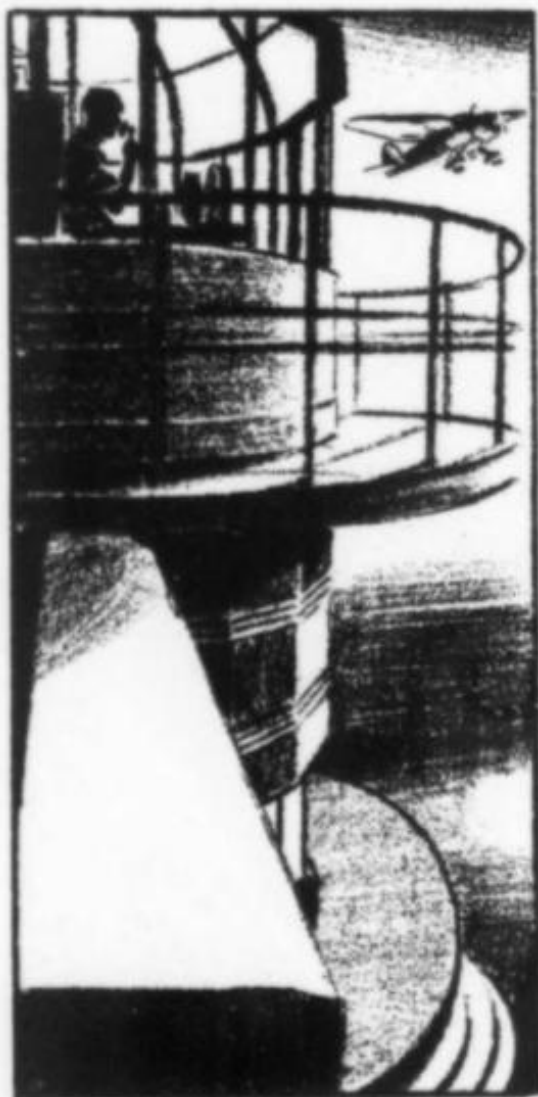
"All clear? Can I land?"
Hundreds of times daily the
Newark Airport Controller
must answer these radio-
phone questions from pilots.

by Douglas Rolfe



KEY TO RADIOPHONE EQUIPMENT
RECEIVING SETS ONLY...
SEPARATE SPEAKERS
SPEAKERS ATTACHED

Above—Floor plan of
Traffic Control Tower
showing layout of the
equipment. Left—
From the tower, the
Traffic Controller has
an unobstructed view
of the sky and field.
He contacts all planes.

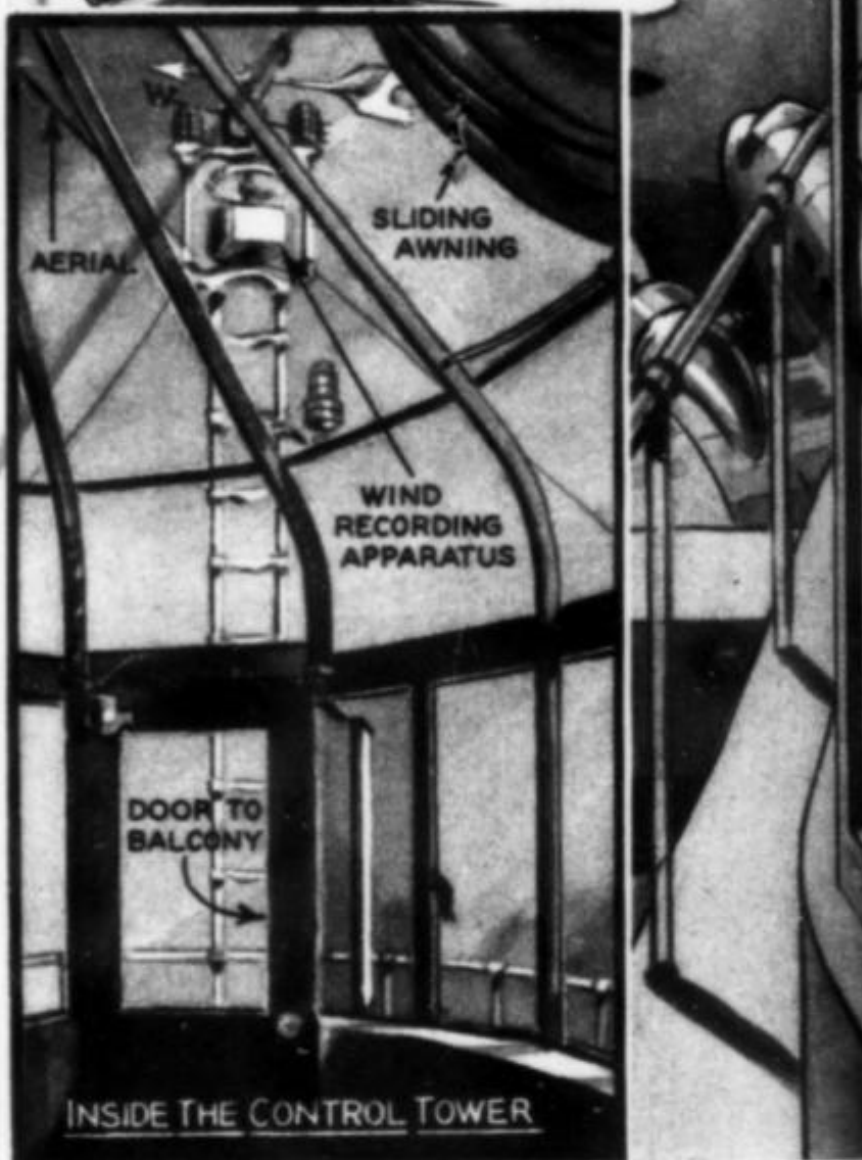


The base of the Traffic Control Tower forms the Airways Control Room. Charts showing position of planes en route are plotted every 15 minutes.



THE TRAFFIC BEAM

OR VISUAL SIGNAL IS
USED TO REGULATE ALL
NON-RADIO EQUIPPED TRAFFIC
ENTERING OR LEAVING NEWARK



INSIDE THE CONTROL TOWER

NEWARK AIRPORT—busiest air terminal in the United States, if not the entire world—is equipped with every device known to science for the efficient control of air traffic. The huge air liners of the United, TWA, American Airways, and Eastern Air Lines are enabled to arrive and depart with a maximum of safety and minimum loss of time. Itinerant private and commercial planes are also efficiently controlled at this most modern airport.

A small glass enclosure atop the Administration Building houses the Traffic Controller and his assistant who have an unobstructed view of the field and sky in every direction. Two

Modern Mechanix

PERMIT EITHER
TO BE TRAIN-
BE SIGNALLLED

IGHTING TUBE

HOW COLLISION RISKS ARE MINIMIZED

SHIPS ARRIVING AND DEPARTING ON THE SAME AIRWAY ARE VERBALLY ADVISED THE CORRECT ALTITUDE TO ASSUME IN ORDER TO BE "IN THE CLEAR"

PILOTS INFORMED OF THEIR PROXIMITY TO ONE ANOTHER BY THE TRAFFIC CONTROLLER

FLIGHT PATH OF INBOUND TRIP

PILOT REPORTS POSITION, ALTITUDE AND ESTIMATED TIME OF ARRIVAL

FLIGHT PATH OF OUTBOUND TRIP

LAST RADIO MARKER EN ROUTE TO AIRPORT

USING THE VISUAL SIGNAL



THE AIRWAYS
CONTROL ROOM

INSIDE THE CONTROL TOWER

THE TRAFFIC CONTROLLER USING A TWO-WAY RADIOPHONE TO DIRECT MOVEMENTS INTO AND OUT OF THE PORT. THE TOWER IS NORMALLY MANNED BY A CREW OF 2.

TRANSMITTER

The Traffic Controller at Newark Airport uses radiophone and light beams to direct air traffic. Planes are advised when to land or take off. Pilots without radio equipment are advised by red or green light beams directed at plane.

men are on duty night and day. An Airways Control Room is located in the base of the Traffic Controller's tower. Here, the radiophone reports from planes en route are received and charts showing the approximate position, speed, and altitude of every plane in transit are plotted at 15 minute intervals.

Incoming planes radio their approach to the field and the Traffic Controller, informed by the "AC" room as to the nearness of other

approaching planes, radios back directions as to what altitude to approach the field at, weather conditions, direction of wind, etc. Approaching the field at the specified altitude, the pilot soon receives a message that the field is "clear" and a landing can be made. Outgoing planes are informed as to when they can take off and what altitude must be reached before a turn onto the desired course is permissible. Collision danger is eliminated.

MODERN

March

NSC

MECHANIX

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SEE PAGE 68

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Engineers Cut Florida In Two To



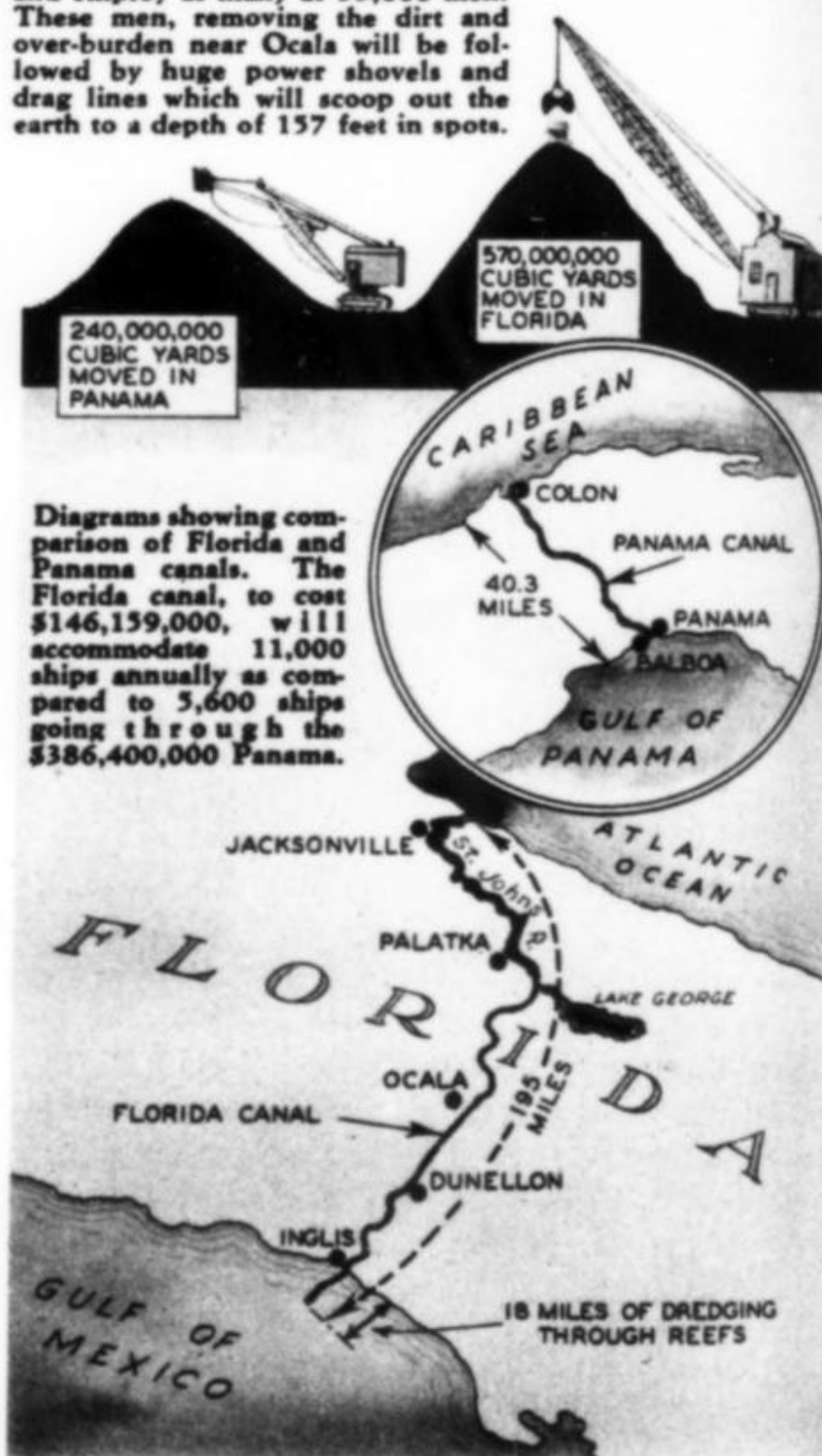
ON SEPTEMBER 2, 1935, the 8,000-ton passenger-ship *Dixie*, plying between New Orleans and New York City, churned through the treacherous straits off Florida's southern tip. Hurricane winds were raging, and furious seas pounded the *Dixie's* staunch hull. Suddenly, with a shivering groan, the ship smashed aground on French Reef.

Even as waves battered the ill-fated *Dixie*, the president of the United States authorized a plan to end such terrors of the sea. And on September 19 President Roosevelt sat in his home at Hyde Park and pressed a golden telegraph-key. An electrical impulse sped over wires to Ocala, Florida, where it detonated a charge that sent a geyser of earth roaring into the air. Hundreds of spectators cheered, for that blast was symbolic.

It meant that our government, at a cost of \$146,000,000, was taking steps to abolish the perils of Florida navigation. It meant that within a few years the disasters of which the *Dixie* was only a more fortunate example would be no more. For President Roosevelt's finger started construction on the Trans-Florida Ship Canal, the most colossal waterways venture ever undertaken by America—not even excepting mighty Panama!

Looked on from another angle—from that of the light pleasure yacht—the canal provides a connecting link between the Atlantic Inland Waterways System and the Gulf Inland System. When completed it will allow small craft to follow a protected route from Boston, Massachusetts, to sunny Mexico—a route in which boats will be carefully sheltered from heavy ocean seas and winds.

More than 26,000 acres of timber and brush must be cleared to make way for the great Florida canal, a project which is to last six years and employ as many as 35,000 men. These men, removing the dirt and over-burden near Ocala will be followed by huge power shovels and drag lines which will scoop out the earth to a depth of 157 feet in spots.



by W.

Why a
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Maga

How To Speed Sea Commerce

by W. A. SWANBERG

Why a Florida canal? To save lives and time; to cheat shoals and storms; to aid commerce and open new routes to pleasure craft.



Circle, above—The starting gun for the Florida canal project was this dynamite charge set off telegraphically by President Roosevelt. Above—The race is on! All types of excavating machinery swing into action once the overburden is cleared off.



Here is the famous "Inside Route" by which skippers of small pleasure craft can travel from Boston to the Mexican line, sheltered in all but a few spots from the open sea. Canals now under construction will eliminate these danger spots, making the route one of the most enjoyable in the world. The Florida canal will open new horizons for the owners of pleasure boats.

Down through the centuries men have seen the need of this canal. Hardy Spanish navigators around the year 1600 quailed at the hazardous reefs off southern Florida, and they proposed a canal through the peninsula itself as a solution. Later, under French ownership, actual surveys for such a project were made. In 1830 the U. S. Board of Internal Improvements made another survey of the undertaking. But the immense magnitude of the idea was frightening, and the historic dream was again delayed.

Now, in 1936, the U. S. Army Corps of Engineers is not frightened by the prospect. They respect its proportions, but they know it can be done—and they are doing it. Progress on the central portion of the canal is already impressive, and is being directed from Ocala by Lieutenant Col. Brehon B. Somervell, the engineer in charge. A sizeable start has been made on the 26,000 acres of timber and brush that must be cleared. Forms for bridge foundations are being constructed, and huge

[Continued on page 138]



JAN.

MODERN MECHANIX

AND INVENTIONS

NOW

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TANK BATTLESHIP
SEE PAGE 32



STARTLING MILITARY SECRETS OF THE
NEXT WORLD WAR

By PAUL MALLON, Noted Washington Observer

PRICE 15 CENTS
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MODERN MECHANIX AND INVENTIONS



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January, 1934

Number 3

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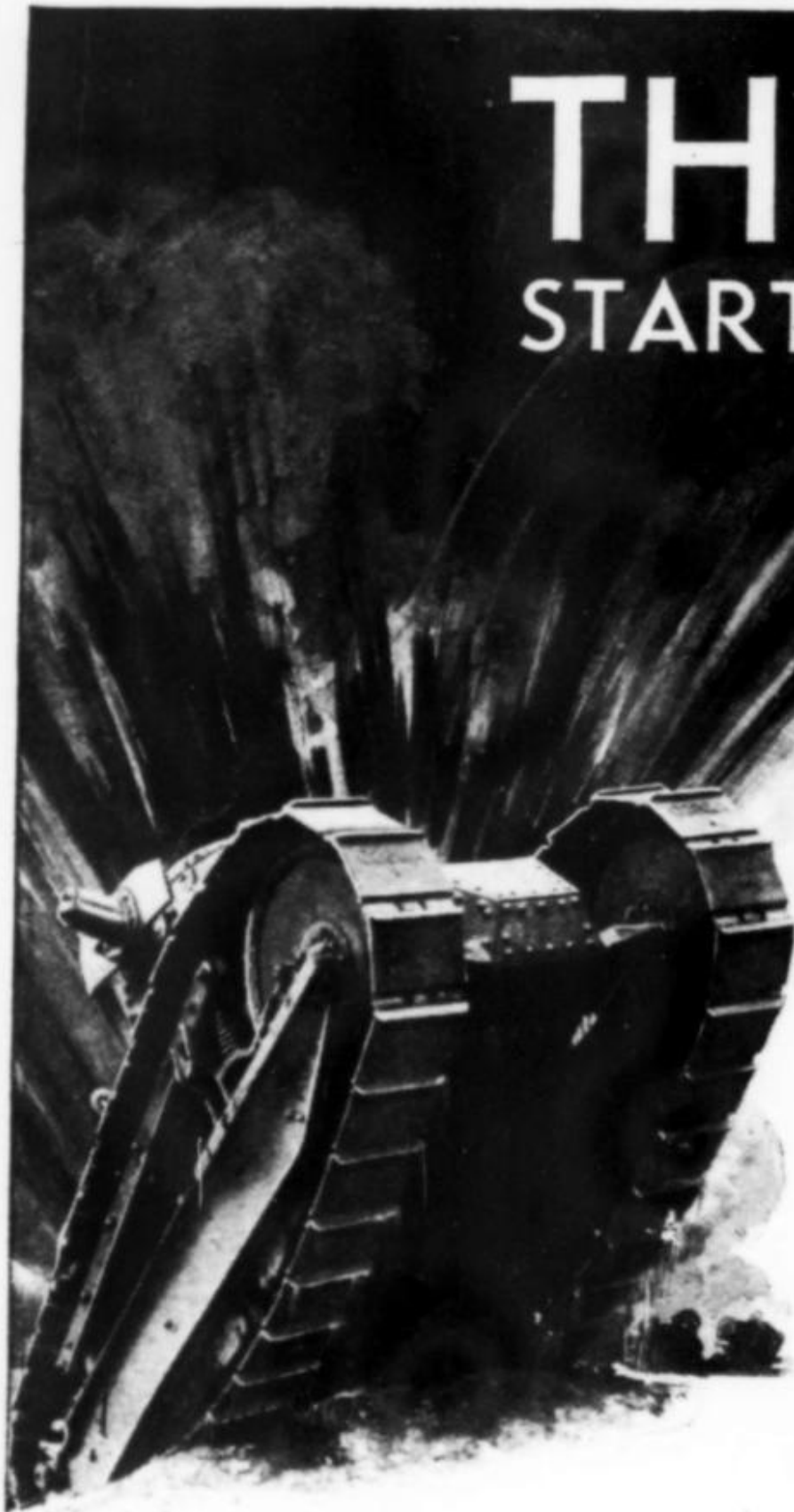
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THE NEXT STARTLING MILITARY



A tank going over the top. The next war will not be fought by massed men, but a mechanized infantry, great aerial battles and with bacteria and gas bombs.



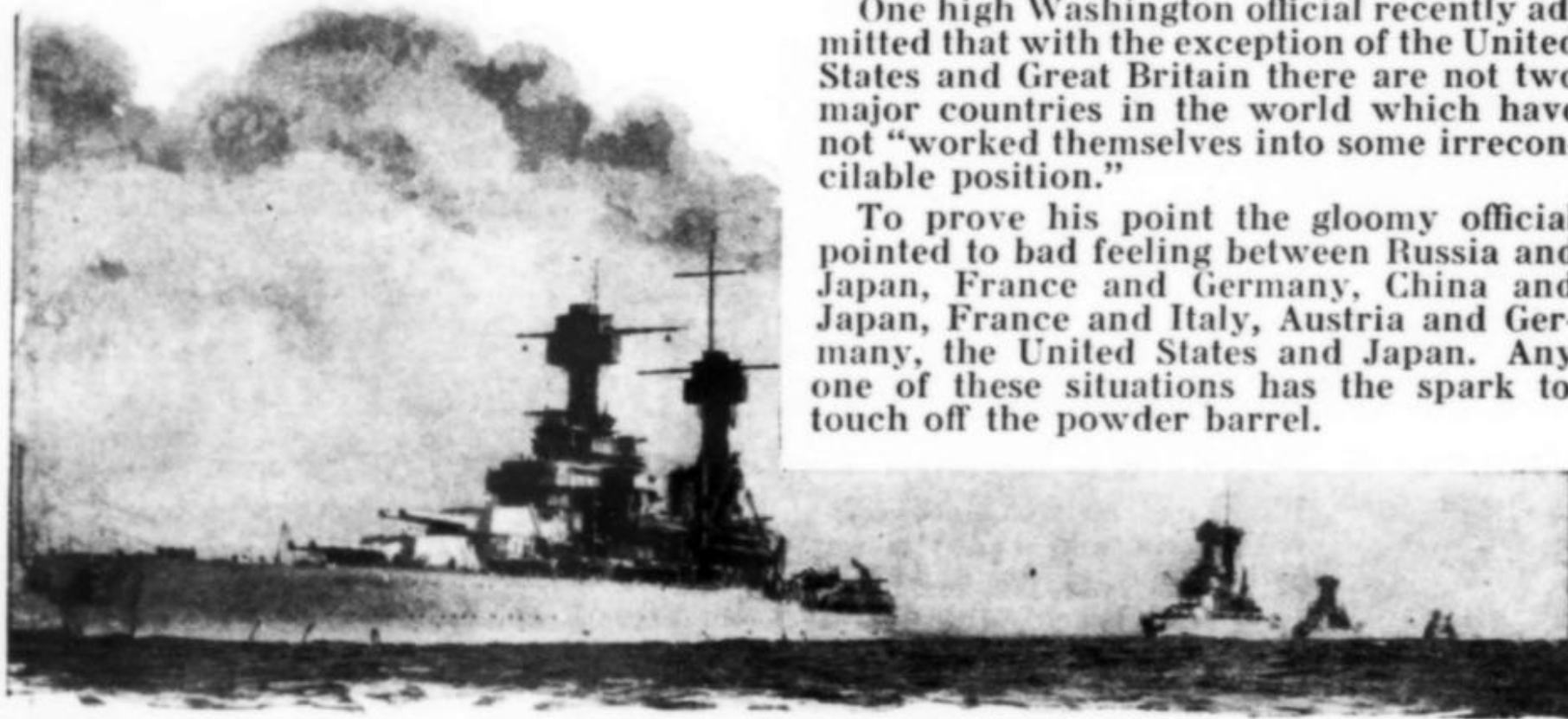
by PAUL MALLON
Noted Washington Observer

EDITOR'S NOTE—War threatens the peace of the world. Forebodings of another international conflict suddenly overshadowed the earth when Germany withdrew from the Disarmament Conference and the League of Nations. France is ready to cross swords with her ancient foe. She has spent \$100,000,000 for great underground fortifications. Japan, it is said, envisions an Asiatic league that would include the Philippines, China and possibly India and Australia. Russia is mobilizing troops for war with Japan. In view of these facts MODERN MECHANIX AND INVENTIONS has asked Paul Mallon, whose inside stories on events in Washington are read by millions daily, to reveal the unknown secret preparations for the next World War. His many startling revelations are included in the following article.

THE next war has been in the making for fifteen years—ever since the last one.

One high Washington official recently admitted that with the exception of the United States and Great Britain there are not two major countries in the world which have not "worked themselves into some irreconcilable position."

To prove his point the gloomy official pointed to bad feeling between Russia and Japan, France and Germany, China and Japan, France and Italy, Austria and Germany, the United States and Japan. Any one of these situations has the spark to touch off the powder barrel.



Uncle Sam's watchdogs of the Pacific steaming out of Los Angeles harbor. President Roosevelt promptly met the threat of war. He now is building the navy up to full treaty strength with an appropriation of more than \$238,000,000.

WORLD WAR!

SECRETS REVEALED

DO YOU KNOW THAT—

Odds are 3 to 1 war will be declared in sixteen months?
The United States has issued sealed war orders to all industry?
War probably will break out first between Japan and Russia?

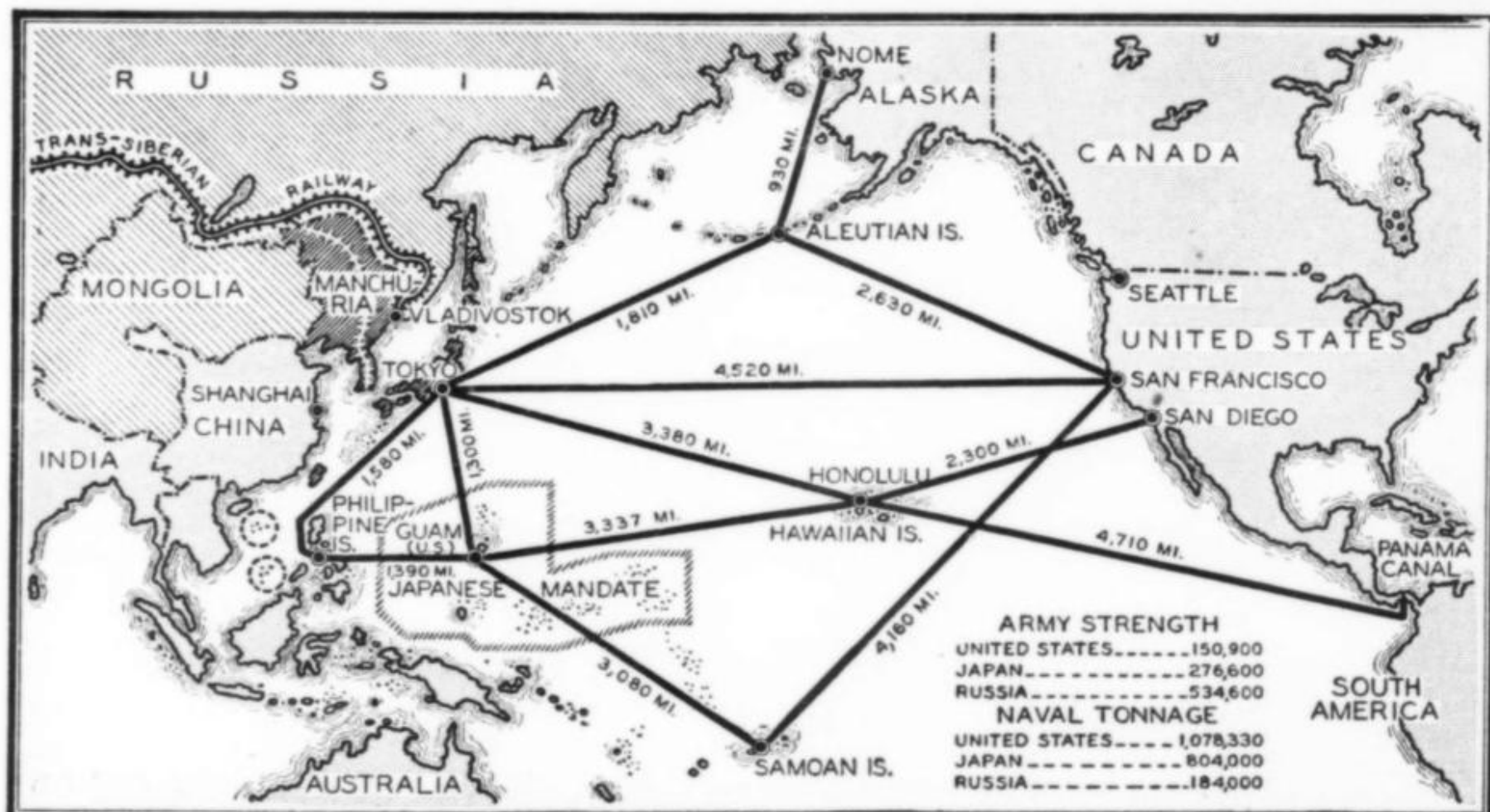
Lloyds, the great insurance and long-shot experts of London, think war from one of these irreconcilable spots is a good bet. They were reported to be offering 3 to 1 odds on war within 18 months when the Washington official did his talking. That leaves only 16 months more.

What Lloyds had its eye on was the Far East. Russia is suddenly very cocky.

She isn't saying anything official about it, but the fact that the long-awaited double-tracking of the Trans-Siberian railroad is completed has leaked out. Its completion took a year of work which began with the

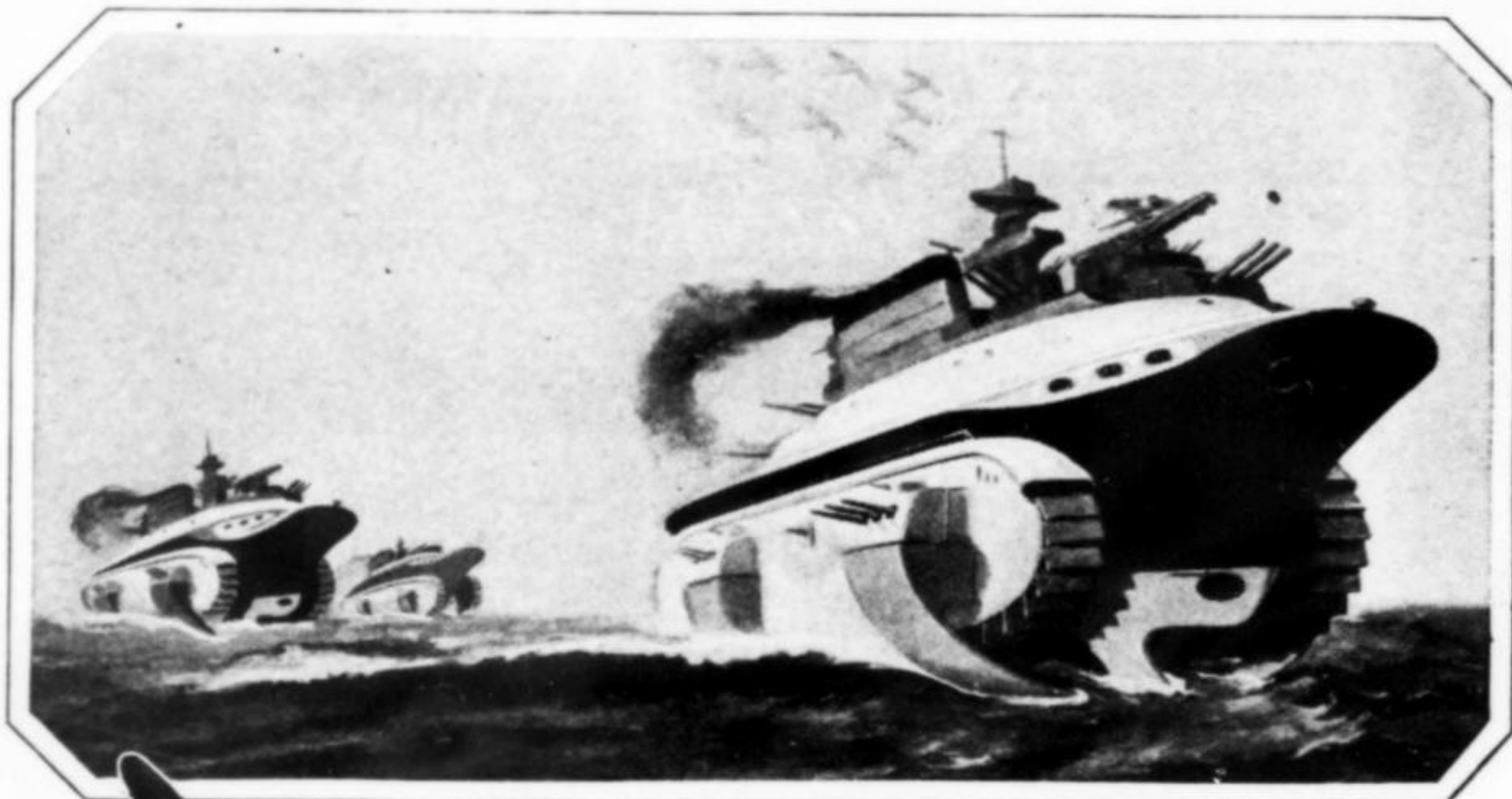


Huge guns that guard the U. S. seacoasts are shown above. The United States is ready to meet sea or air attacks.

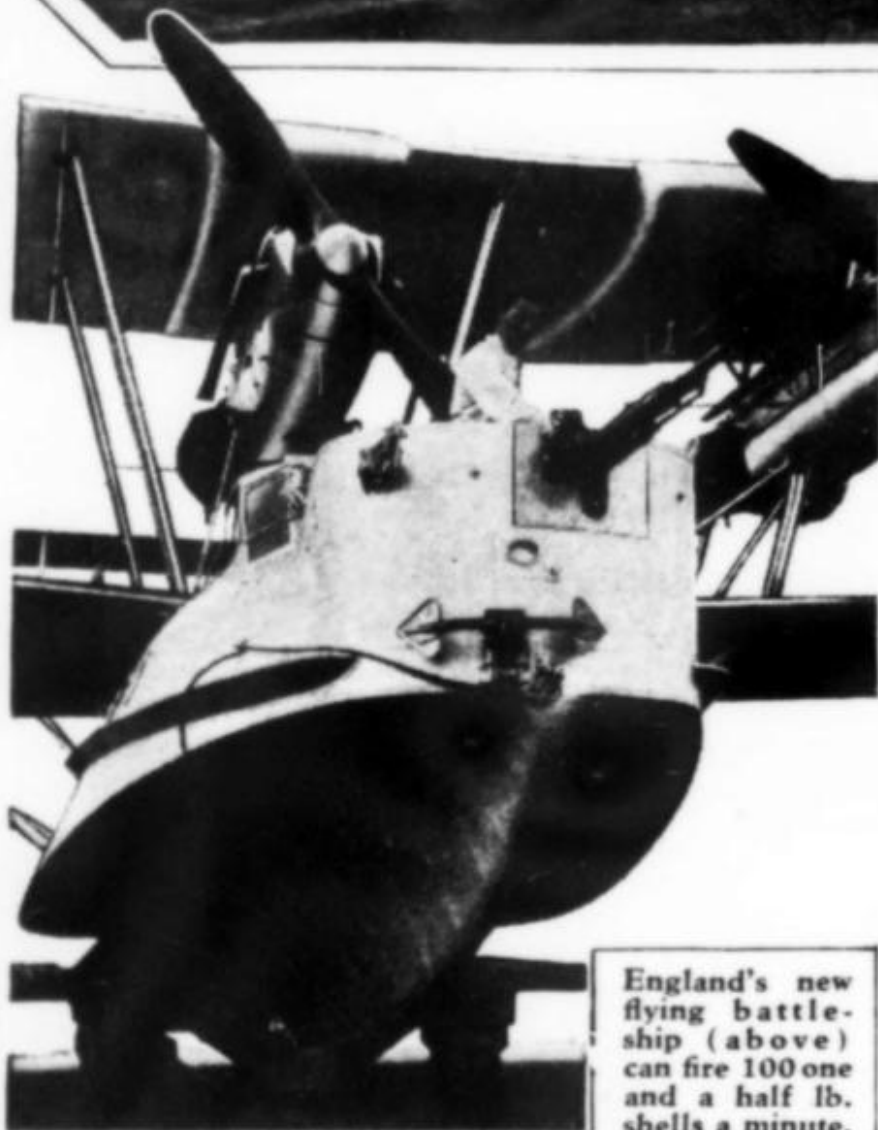


Japan, quitting the League, kept mandate islands which now may be fortified. Note from comparative distances how easily Japan can strike U. S. possessions. If Japan gets claims to circled islands, Philippines will be surrounded by Jap naval bases. Russia, fearing war with Japan, secretly double-tracked Trans-Siberian railroad for quick mobilization.

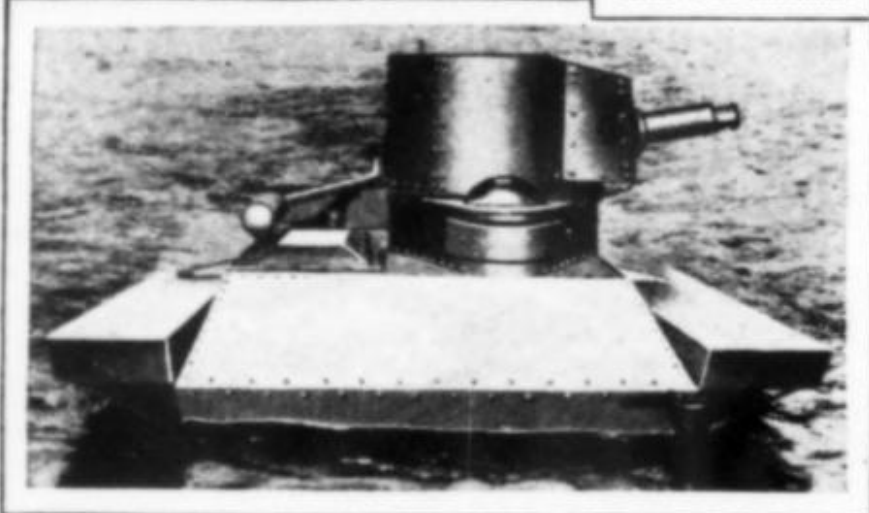
Floating Tanks and Flying Battleships Among Latest War Inventions



Amphibious tanks that can travel on water as well as land have been developed by several nations. An artist's conception of the next possible development, seagoing battleship tanks with caterpillar propulsion, is shown above.



England's new flying battleship (above) can fire 100 one and a half lb. shells a minute.



This water and land British tank travels at a speed of six miles an hour on water and 40 m.p.h. on land. In the water the tank is driven by a propeller and steered by a rudder. Pontoons on the side of the tank keep it afloat. These can be seen plainly in the above front view photo.

first threatening Japanese gesture in Manchuria.

Some of the track is reported still to be very sketchy. But Russia believes she can move munitions east and bring empty trains back without a traffic jam. That is the important thing. It has been since Japan, 25 years ago, whipped an almost isolated Russian force in Siberia.

Two railroad tracks, however, are not what they were 25 years ago in the days before aerial bombing. Japan knows that. Russia knows it, too. Two hundred of her 800 odd fighting planes are concentrated in the Vladivostok area to protect the new railroad.

The planes will not be needed on the western frontier because Russia has quietly closed non-aggression pacts with all her neighbors there. Everyone here knew she made those pacts so she could turn her face to Japan for fighting.

In the west France and Germany can find much more than a railroad to make faces about. That situation is well known.

Germany resents the English armaments stand, wants to remove the wedge which the Polish corridor has driven between the Fatherland and East Prussia. France dislikes Italian military and naval pretensions, would prefer to keep England and most of Europe in awe of her financial strength, and calls Uncle Sam a Shylock over war debts.

The United States calls France a bad debtor, peers closely at the tonnage figures for the Japanese navy, has kept her own navy in Pacific waters "for reasons of economy" since the last Manchurian crisis.

If you sit down with a pencil and paper to figure it all out, including the probable

Modern Mechanix and

Russia Mobilizes Troops; Most Nations Are Ready for Bacteria Warfare



Russia is moving guns and troops over the newly double-tracked Trans-Siberian to be ready for a possible clash with Japan on the borders of the republic of Manchukuo.

winners, you will get nothing but a headache. Digging through the League of Nations' Armament Yearbook produces a silly table like this:

	Army	Air-planes	Naval Tonnage
United States...	150,900	2,367	1,078,330
Japan	276,600	1,639	804,000
Russia	534,600	750	184,000
China	1,323,000		28,600
England	522,902	1,434	1,138,700
Germany	105,000		156,800
France	593,000	2,286	669,000
Italy	517,100		432,000

A glance shows that there is something wrong with the figures. Italy has no air-planes, not even the 25 that flew over to Chicago!

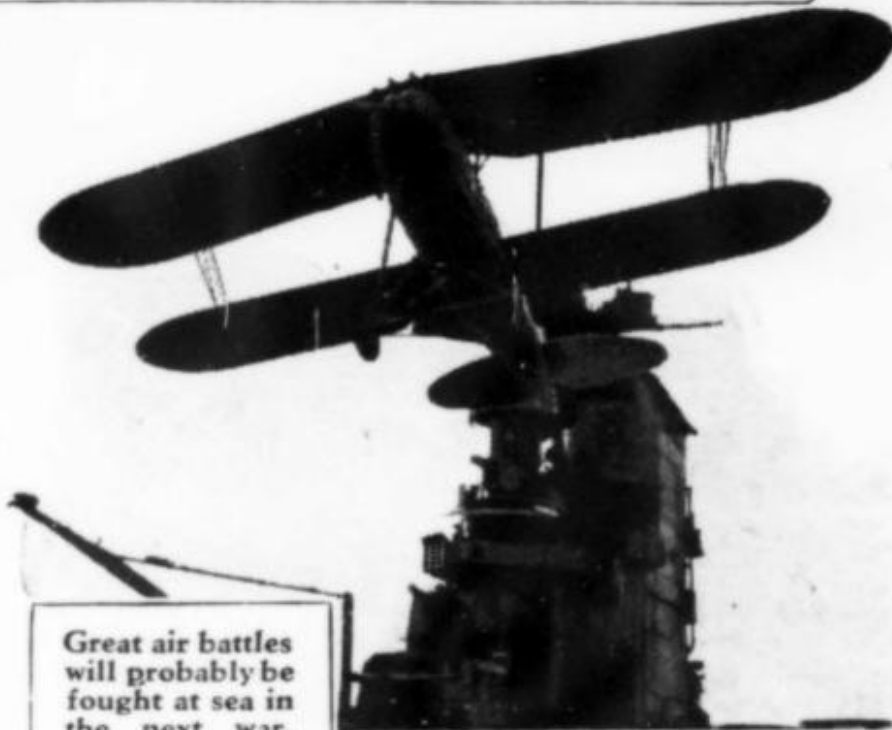
The truth is the League gets its figures from the war offices of the various governments. Mussolini or Air Minister Italo Balbo must have decided the total for the Italian air fleet would not look well in print.

China was bashful about its airplanes, too, probably for different reasons. Japan and Russia apparently had the same feelings about the true totals for their armies which are reported to be three times the figures published.

There are no honest figures on relative military and naval strength. The questions of reserves, total man-power, equipment, industrial support, chemical weapons, naval obsolescence, economic self-sufficiency and several other things are not even calculated.

While the statesmen of the world have been bleating about such figures, earnest

Inventions for January

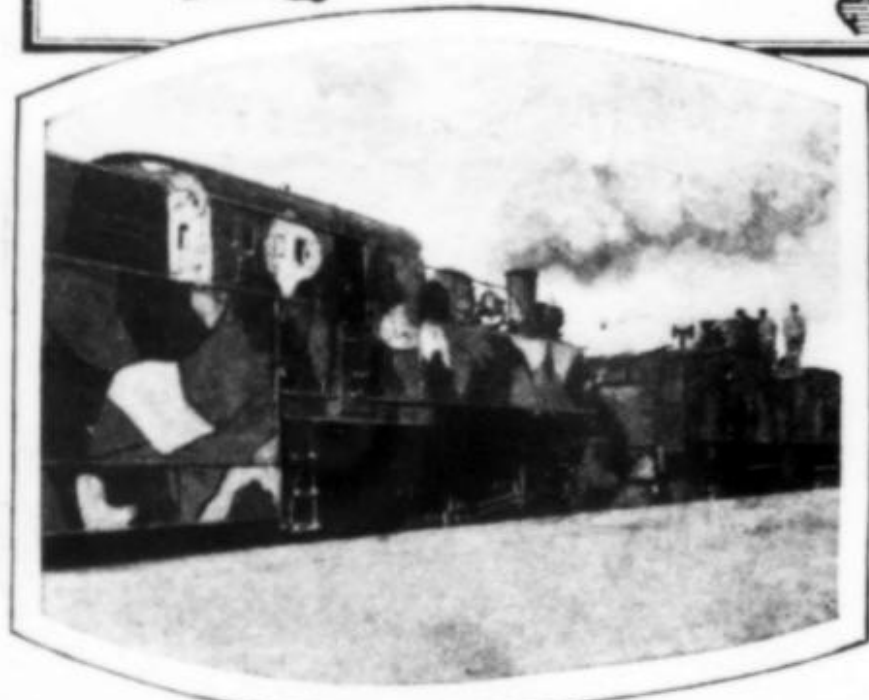


Great air battles will probably be fought at sea in the next war. Here is a war-bird taking off from the U. S. aircraft carrier Lexington.



Hand grenades, as well as air bombs, may be loaded with disease bacteria to wipe out enemy forces in the new war. Hand gas bombs are being tested in the above photograph.

Russia, Question Mark of Europe, May Decide the Victor in Next War



This camouflaged armored train is used to move troops in Manchukuo, alleged Jap puppet state, where Russia fears war in a dispute over the Chinese Eastern railroad.

preparations are going on in the laboratories. These activities are very carefully concealed because publicity would ruin them. Some are being conducted in violation of treaties. Also there is danger that if the formulas of new weapons get out its efficiency will soon be curtailed by discovery of the antidote.

For these reasons it is very difficult to tell exactly what the next war will be like but enough information has seeped through the underground diplomatic channels of the world to enable the schemers to get a general picture.

It will be as far advanced over the World War as the World War was over the Civil War. It will be a war of scientists and not mainly of men. The chemical weapon will be the greatest. Gases and poisons beyond the comprehensions of the average individual will be used to such an extent that they might annihilate the world if defense laboratories had not already worked out a preventative.

(Continued on page 137)



U. S. oxygen-helmeted aviators, like the one above, can send and receive visual orders. Observer sent this "flash" & map by radio.

—FLASH—
SEND BOMBER—LOCATED TWO SUBS APPROACHING GOLDEN GATE



WILL STAND BY AND OBSERVE —ABC—



Above—A torpedo fired from a destroyer. Torpedoes have been developed that leave no wakes to warn enemy ships. Infra-red rays will guide the torpedoes to enemy vessels.

Giant Rotor Takes Power From Winds

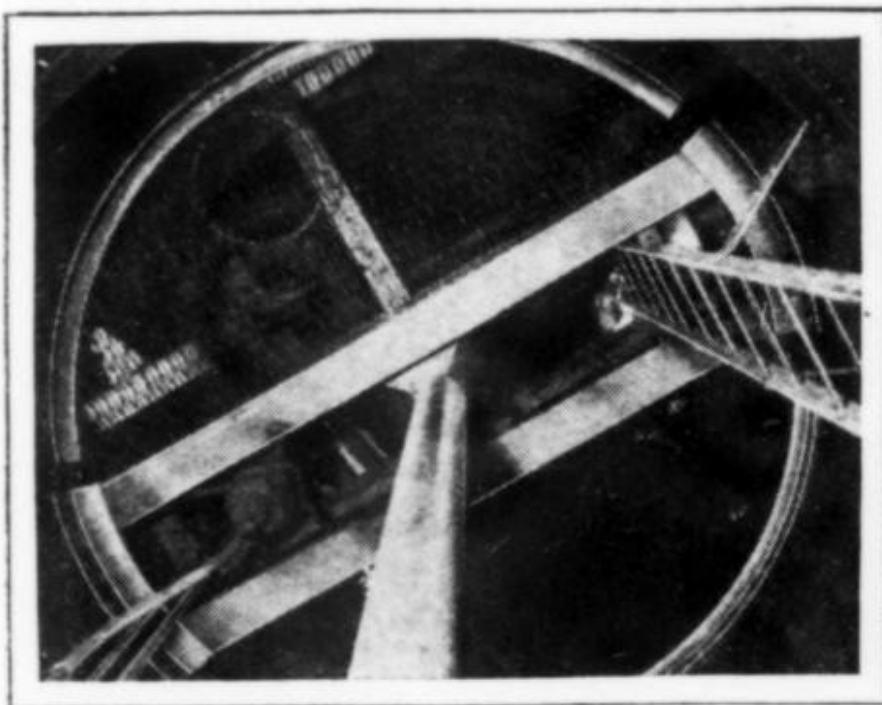
THE first full size unit of a proposed \$2,000,000 Madaras rotor power plant is now ready to convert the power of the winds into electrical energy, after being thoroughly tested by its inventor, Julian D. Madaras.

If test results verify the calculated power-generating possibilities of the wind rotor, it is expected that work on the complete plant will be begun shortly.

During the first test, which was viewed by representatives of the public utility companies which are financing the project, the rotor carriage was held stationary by huge steel bars anchored deep in the earth. Heavy scales recorded the pull as the rotor was spun at different speeds by its electric starting motor.

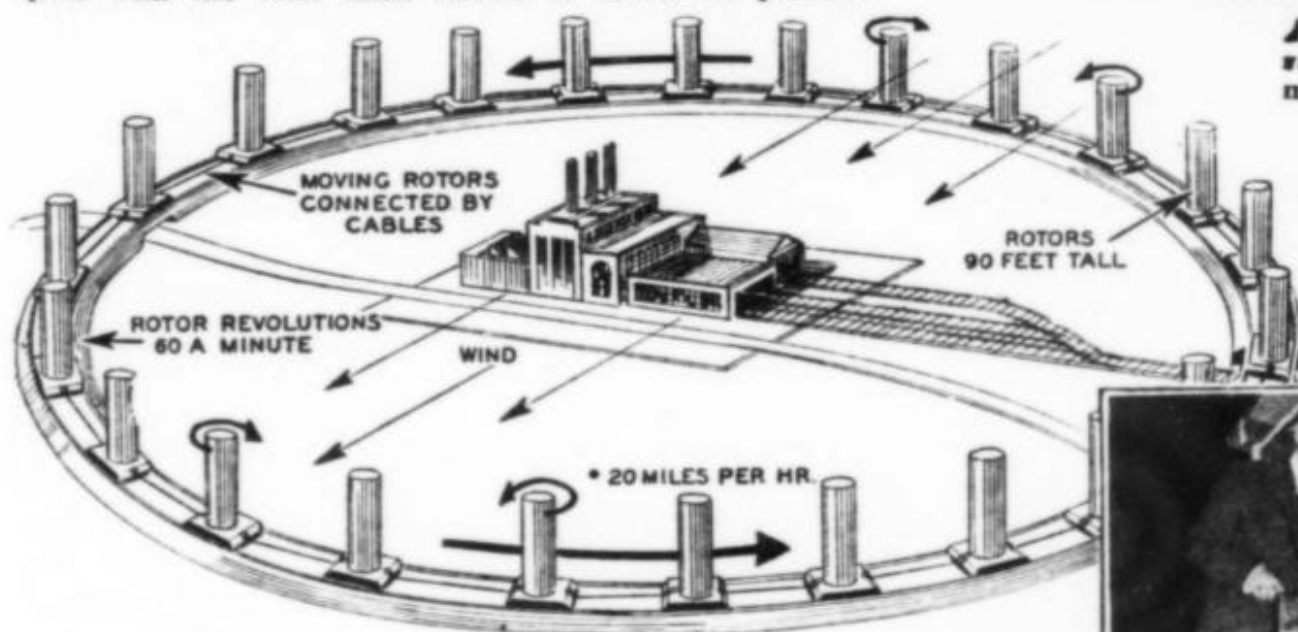
In the proposed plant twenty or more rotors mounted on 30-foot wide railway carriages will be coupled together with cables, and travel around a track one-half mile in diameter.

Electric motors on each carriage will be used to turn the rotors in starting up the train of rotor cars. Once the wind has brought the train up to its operating speed of 20 m.p.h., the



Looking upward from the inside of the 90-foot steel inner shell of the first Madaras wind rotor. Outside this shell is a duralumin cylinder weighing but 4000 pounds, which spins with the steel shaft shown in center of picture.

This 90-foot spinning chimney is being tested in a strong wind at Burlington, New Jersey, before public utility officials. During this first test the tower was held stationary as the rotor was spun, and the tractive force developed was measured with enormous steel scales.



A sketch of the proposed Madaras rotor power plant, consisting of 20 or more rotor cars coupled together with cable, and traveling around the circular railroad track. With the wind as shown, rotors would change their rotation at the tunnels. Air moving with huge rotors is opposed by wind on one side, creating vacuum, and speeded up on other, to set up pressure.

motors will be cut out, and the rotors kept spinning by direct connection with the wheels.

Huge electric dynamos geared to the carriage wheels will generate the electric power.

Trolleys on each car will make contact with trolley lines surrounding the track, to feed the generated power into the power house for transformation to higher voltages.



Julian D. Madaras inspects the vertical electric motor which can spin his 90-foot rotor tower at peripheral speeds of from 40 to 60 m.p.h.

FAWCETT'S

JUNE 25c

MODERN MECHANICS AND INVENTIONS

TO MAKE THIS
AERO RACER
SEE PAGE 104



STEWART
ROUSE

**PRIZES FOR HOME BUILT BABY AUTOS
THRILL MAKERS OF CONEY ISLAND**

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June, 1931

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Will the Nautilus Freeze

by LEW HOLT

Within a few weeks Sir Hubert Wilkins and his crew of 18 will set forth to burrow under the North Pole in a submarine. Have they any chance of success, or is the expedition foolhardy—are the daring adventurers doomed to die, frozen beneath Polar ice? Read the opinions of experts.

THE most astonishing scientific expedition the world has ever known will get under way early this summer when the submarine *Nautilus*, under command of Sir Hubert Wilkins and Commander Sloan Danenhower, sets forth to burrow under the frozen Arctic seas which surround the North Pole. A puny, man-made whale of steel and iron is issuing a daring challenge to the unexplored wastes of polar ice which already have a grim record for freezing out the lives of scores of fearless adventurers who sought to penetrate the forbidding fastnesses with ship and dog sled.

The purpose of the expedition is to take scientific observations of the Polar sea, to make weather studies, and to chart unknown territory.

Not even Jules Verne, whose seemingly fantastic prediction of the submarine in "20,000 Leagues Under the Sea" has long since become a sober fact, envisioned so daring an underwater expedition as that of Sir Hubert Wilkins. After all, submarines and the men in them must breathe; they must be able to come to the surface now and then for air, and it is possible that the idea of a submarine imprisoned beneath impenetrable depths of ice at the top of the world, buried alive with its crew gasping out their lives as chemically-created air is exhausted, was too fantastic for even Verne's sturdy imagination.

Fantastic, at first glance, the Wilkins expedition certainly is. In fact, to the layman it is more than fantastic—it is suicidal. This opinion, incidentally, is concurred in by many submarine experts of the world's navies, some of whom are quoted later on in this article. Even the sponsors of the trip have admitted the possibility of a great disas-

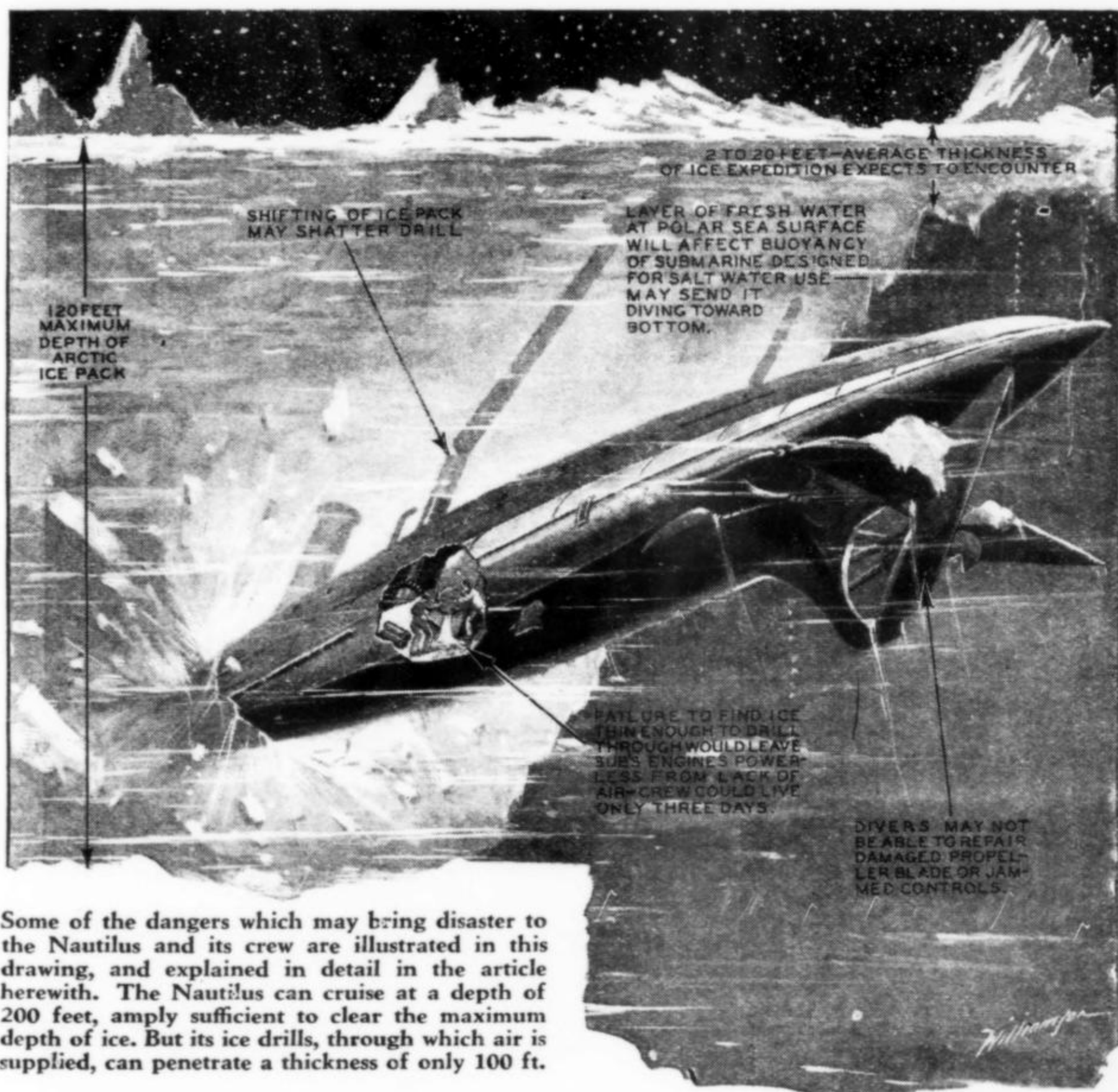


Commander Danenhower and Sir Wilkins examine special electric bulb which will serve as a giant headlight for their Polar submarine.



Here is the Nautilus, the Wilkins Polar submarine, on a trial run. Note the hydraulic bowsprit-bumper on the nose of this unique ship.

Under the North Pole?



Some of the dangers which may bring disaster to the *Nautilus* and its crew are illustrated in this drawing, and explained in detail in the article herewith. The *Nautilus* can cruise at a depth of 200 feet, amply sufficient to clear the maximum depth of ice. But its ice drills, through which air is supplied, can penetrate a thickness of only 100 ft.

ter which will snuff out the *Nautilus* and all aboard it. Yet every resource of science, every mechanical precaution which ingenuity can devise, is incorporated in the *Nautilus* to protect the submarine from anticipated dangers. The detailed drawing on page 48 shows the arrangement of the novel devices which make the *Nautilus* the most unique submarine in all history. Most of these devices—ice-cutting drills, sled runners, diving chambers, etc.—were designed by Simon Lake, veteran submarine inventor.

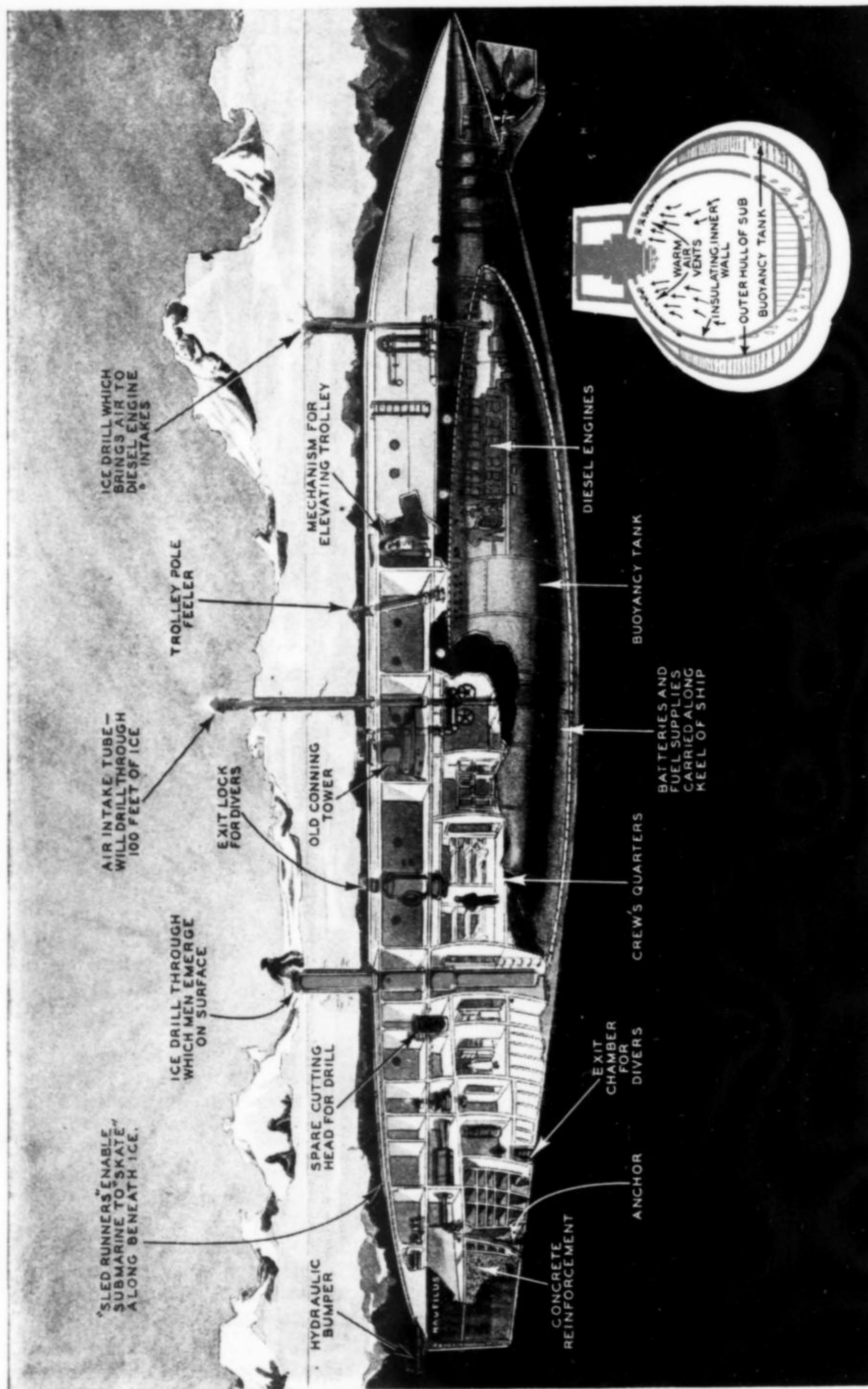
What are the dangers which will imperil the expedition? Some of the most obvious are these:

The *Nautilus* may get caught beneath ice

so thick that its 100-foot drills could not bore through it; consequently the submarine could not get air, without which the men would perish. Air is also essential to run the Diesel engines used to recharge the batteries which drive the sub under water. For eight hours out of the 24 the sub must lie on the surface recharging the batteries.

The bow of the *Nautilus*, reinforced with concrete though it is, may be damaged by collision with obstacles sufficient to spring a leak and flood the interior.

Batteries may be discharged more rapidly than calculated, leaving the submarine powerless.



Cross-section drawing of the Nautilus, showing disposition of special devices which will enable the sub to operate in ice-choked seas. In the lower right corner is a diagram showing the method of insulating the walls which keeps the interior of the huge submarine reasonably warm and dry at all times.

Damaged propellers or control surfaces jammed with ice may not be amenable to repair by divers.

The layer of fresh water covering the polar sea, being lighter than the salt water in which the sub is designed to cruise, will not require full ballast tanks to start the ship submerging. If the ballast tanks are not full, the water in them can "slosh" to the forward or rear ends of the tanks, affecting stability and causing the sub to plunge abruptly toward the bottom. Before control can be re-established, in this event, the *Nautilus* will very probably collapse from excessive pressure, since it is designed for depths of not greater than 250 feet.

Shifting of the ice pack through which the submarine's ice drills are boring for air may

WHO IS RIGHT?

19 Lives Depend on the Answer

The Wilkins submarine expedition claims that the *Nautilus* will be able to travel for 40 hours, or a distance of 125 miles, without recharging its battery. Submarine experts at Third Division Naval Headquarters in New York, analyzing the matter exclusively for *Modern Mechanics and Inventions*, state that a submarine's battery is discharged after an hour's submerged running. On the question of who is right hang the lives of the 19 members of the expedition. Read the opinions expressed in this article.

damage them beyond repair, exerting a "nut cracker" effect.

Areas of open water which the expedition hopes to encounter may not be found when needed.

If caught in an ice pack, the submarine would have no chance to escape.

Navigation, being dependent on observations of moon and stars, is impossible under the ice and the submarine may get "lost."

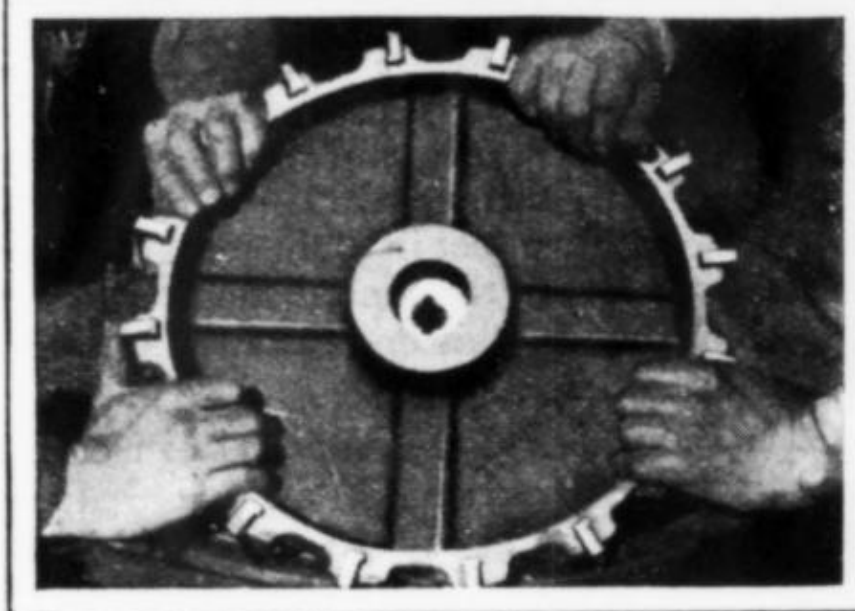
Submarine may not be successful as an ice-breaker, and may freeze solidly in the ice at the surface while lying there to recharge batteries.

These are a few of the dangers which have been pointed out by submarine experts from all over the world. Not all of them are admitted as actual dangers by the crew of the *Nautilus*; others they have themselves anticipated and taken steps to prevent.

The concrete reinforcement of the bow of the *Nautilus* is expected to protect the sub in case of collision with icebergs or underwater obstacles. Commander Danenhower expects

Inventions for June

Conning Tower Drills Through Ice



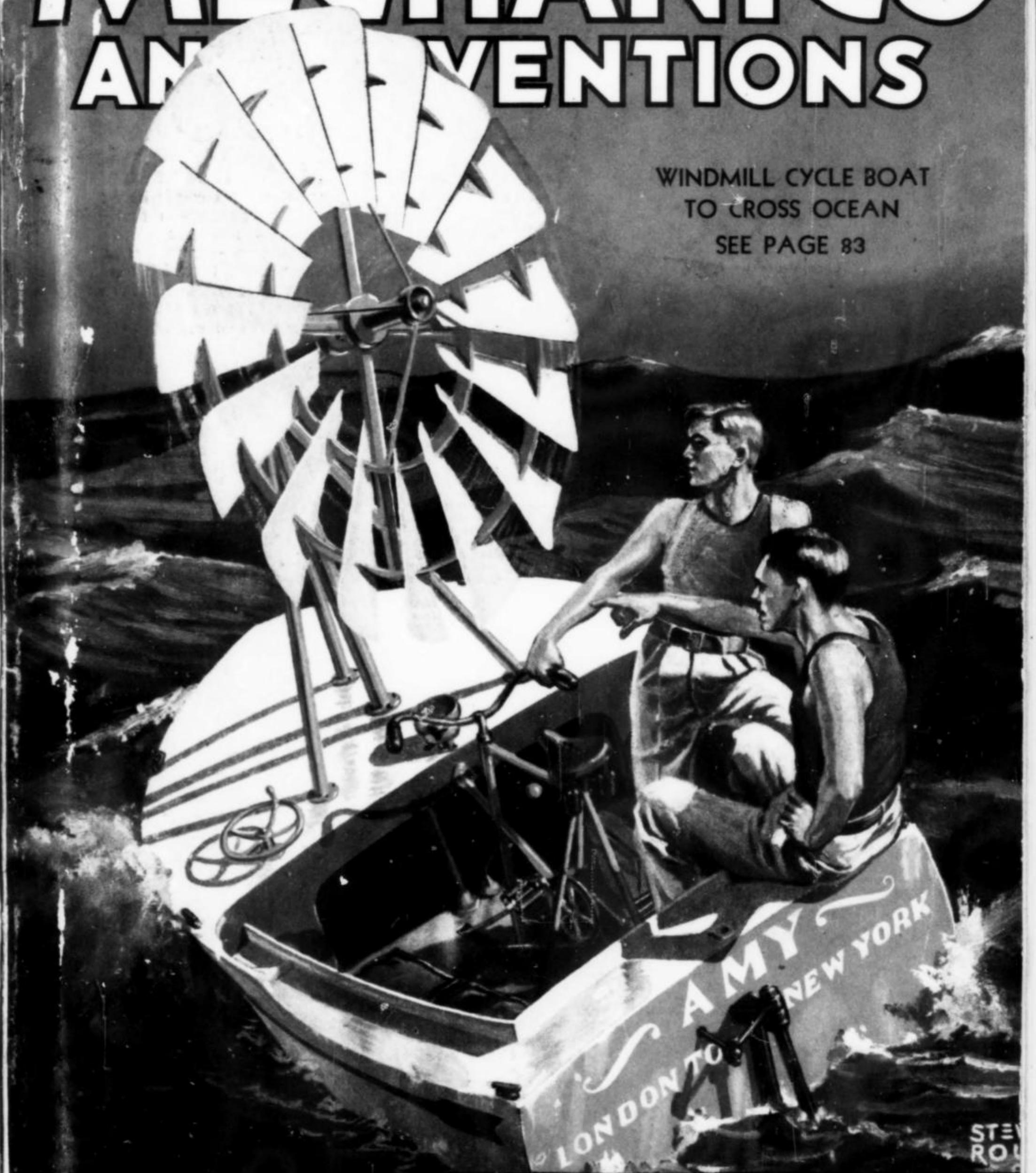
Men will climb up through a conning tower equipped with an ice-cutting head, as shown above, which penetrates through 13 ft. of ice. The cutting head, a close-up view of which is shown in the inset photograph, is revolved at a speed of eight revolutions per minute. Speed of cutting is 1 ft. a minute.

FAWCETT'S

NOV. 25c

MODERN MECHANICS AND INVENTIONS

WINDMILL CYCLE BOAT
TO CROSS OCEAN
SEE PAGE 83



New Weapons *for the* Next War

A FAWCETT PUBLICATION
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November, 1931

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Comfort, Speed Provided by

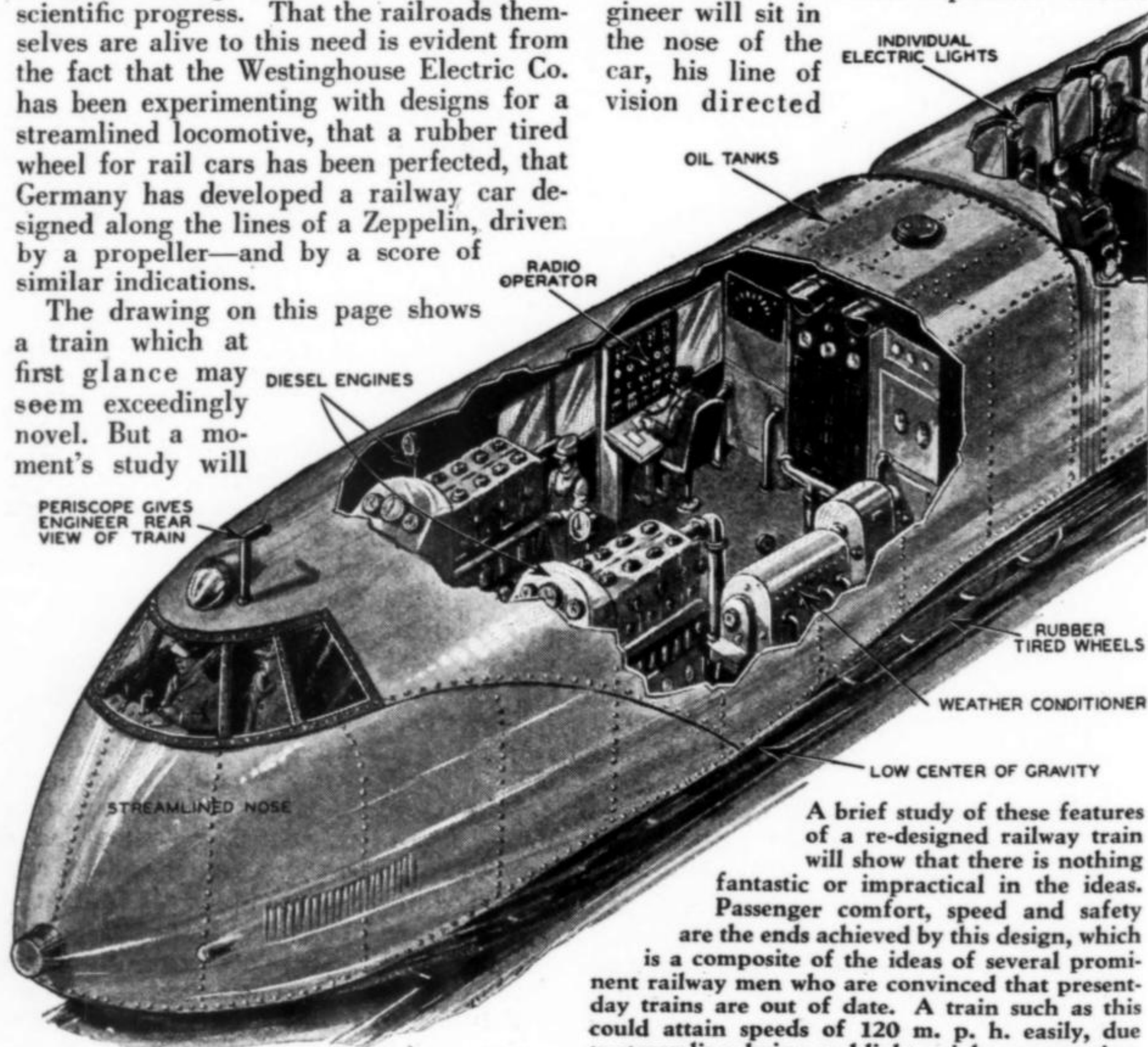
PPRIVATE automobiles, buses and trucks have in recent years taken away so much passenger and freight traffic from the railroads that profits of many of the largest railways have shrunk alarmingly. This situation has awakened executives to the realization that the modern railroad is, in many respects, not modern at all. Gigantic new locomotives have been built; passenger cars are now constructed of steel instead of wood—but except for a few technical improvements of this sort, today's railway train is little different from its sister of fifty years ago.

What the railroads need to bring back business, in the opinion of forward-looking engineers, is a complete re-designing of trains to take advantage of recent mechanical and scientific progress. That the railroads themselves are alive to this need is evident from the fact that the Westinghouse Electric Co. has been experimenting with designs for a streamlined locomotive, that a rubber tired wheel for rail cars has been perfected, that Germany has developed a railway car designed along the lines of a Zeppelin, driven by a propeller—and by a score of similar indications.

The drawing on this page shows a train which at first glance may seem exceedingly novel. But a moment's study will

serve to show that there is nothing really radical about it. None of the improvements shown are visionary or impractical. Let's take them up one by one, if you are skeptical.

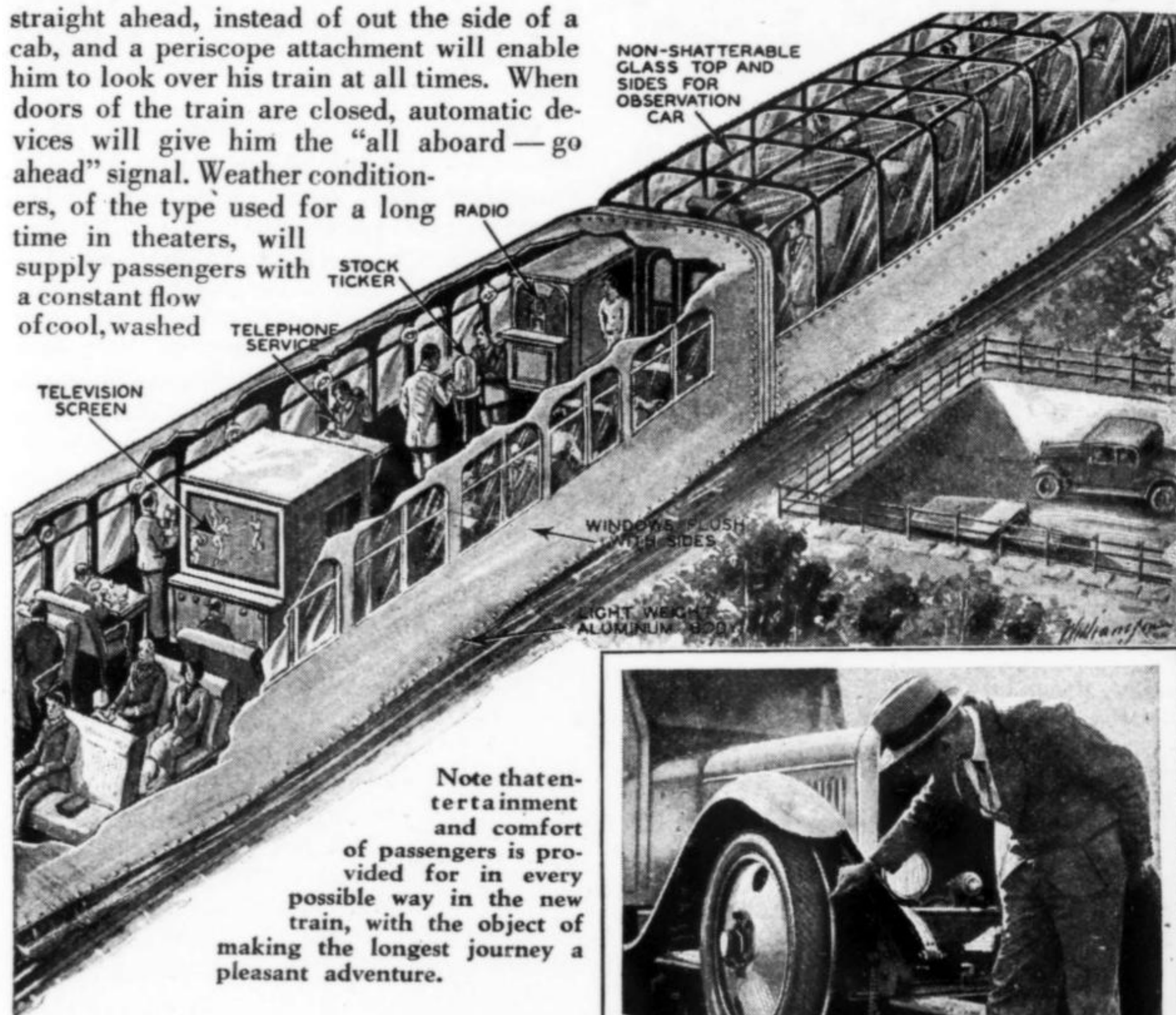
To begin with, steam locomotives in present use are mere refinements of Stevenson's *Rocket*. Cinders and smoke add nothing to passenger comfort, so tomorrow's train will use either oil-burning Diesel engines, hooked up to generators which furnish an electric drive, or if steam boilers are used methods will be perfected for discharging smoke at the rear of the train, where it will not annoy passengers. Whatever the type of locomotive used, it will be streamlined for greater efficiency, since speed—around 120 miles an hour—will give the railroads an advantage which auto buses cannot duplicate. The engineer will sit in the nose of the car, his line of vision directed



A brief study of these features of a re-designed railway train will show that there is nothing fantastic or impractical in the ideas. Passenger comfort, speed and safety are the ends achieved by this design, which is a composite of the ideas of several prominent railway men who are convinced that present-day trains are out of date. A train such as this could attain speeds of 120 m. p. h. easily, due to streamline design and light-weight construction.

Coming TRAIN Design

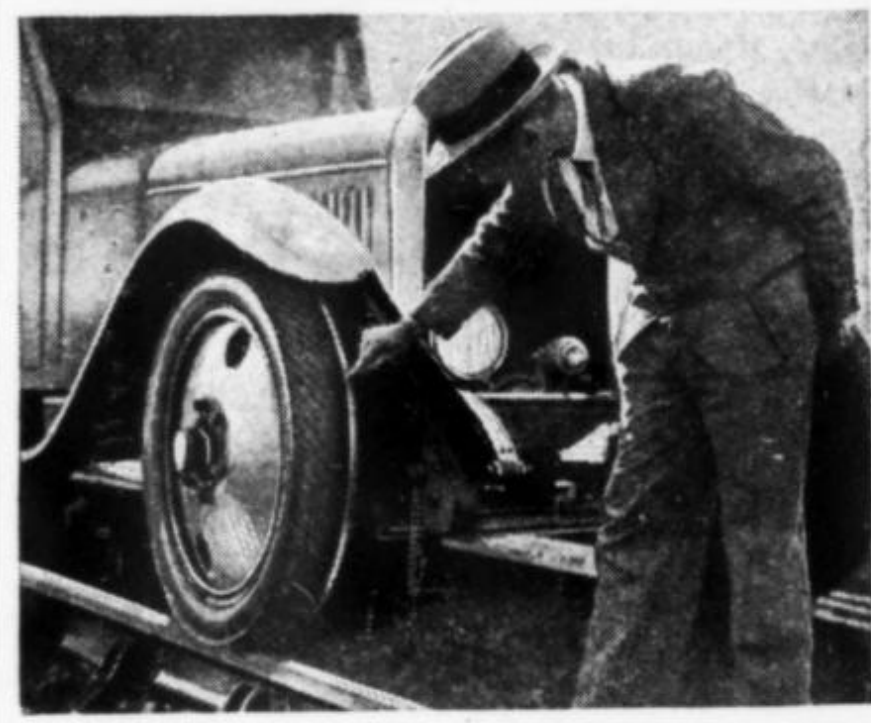
straight ahead, instead of out the side of a cab, and a periscope attachment will enable him to look over his train at all times. When doors of the train are closed, automatic devices will give him the "all aboard—go ahead" signal. Weather conditioners, of the type used for a long time in theaters, will supply passengers with a constant flow of cool, washed



Note that entertainment and comfort of passengers is provided for in every possible way in the new train, with the object of making the longest journey a pleasant adventure.

air at proper temperature. Whether riding through deserts or snowstorms, passengers will be perfectly comfortable. Entertainment devices, such as television screens and radio sets, can easily be installed in trains. Stock ticker service will appeal to business men travelers, who also will appreciate the advantages of having a radio operator on board to send emergency messages. Individual lights at each seat will supplant ceiling lamps.

Rubber-cushioned wheels for trains are now in an experimental stage, and they promise to add immeasurably to the silence of train travel. These wheels do not have rubber rims, but the cushion is placed inside, at the hub. To gain greater speed, alloys of aluminum, light and strong, are beginning to replace steel in car construction. The saving in weight not only speeds up the train, but



A new competitor for railroads is the motor bus fitted with flanges along its wheels for rail travel.

reduces the amount of fuel required and helps to lower the center of gravity of the car, which in turn makes operation safer.

Shatter-proof glass tops and sides for observation cars will be provided, so that in passing through scenic mountain country passengers will be able to gain an unobstructed view. Windows will be built flush with the sides of the cars to offer as little wind resistance as possible. Chairs in the cars, too, will be the latest word in comfort, with deep upholstery replacing the old-time red plush.

MODERN MECHANICS

AND INVENTIONS

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HOW DID
HOUDINI
GET OUT?
PAGE 38

Exposing Houdini's

WORLD FAMOUS TRICKS

MODERN MECHANICS AND INVENTIONS

VOL. II NO. 6

PRICE 25 CENTS

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Edited by Experts

✦✦

Listed below are the members of the Modern Mechanics Board of Editors, all qualified by national reputation to serve as authorities. They will gladly answer questions from readers concerning their departments. Address them in care of this magazine, Robbinsdale, Minn.

✦✦

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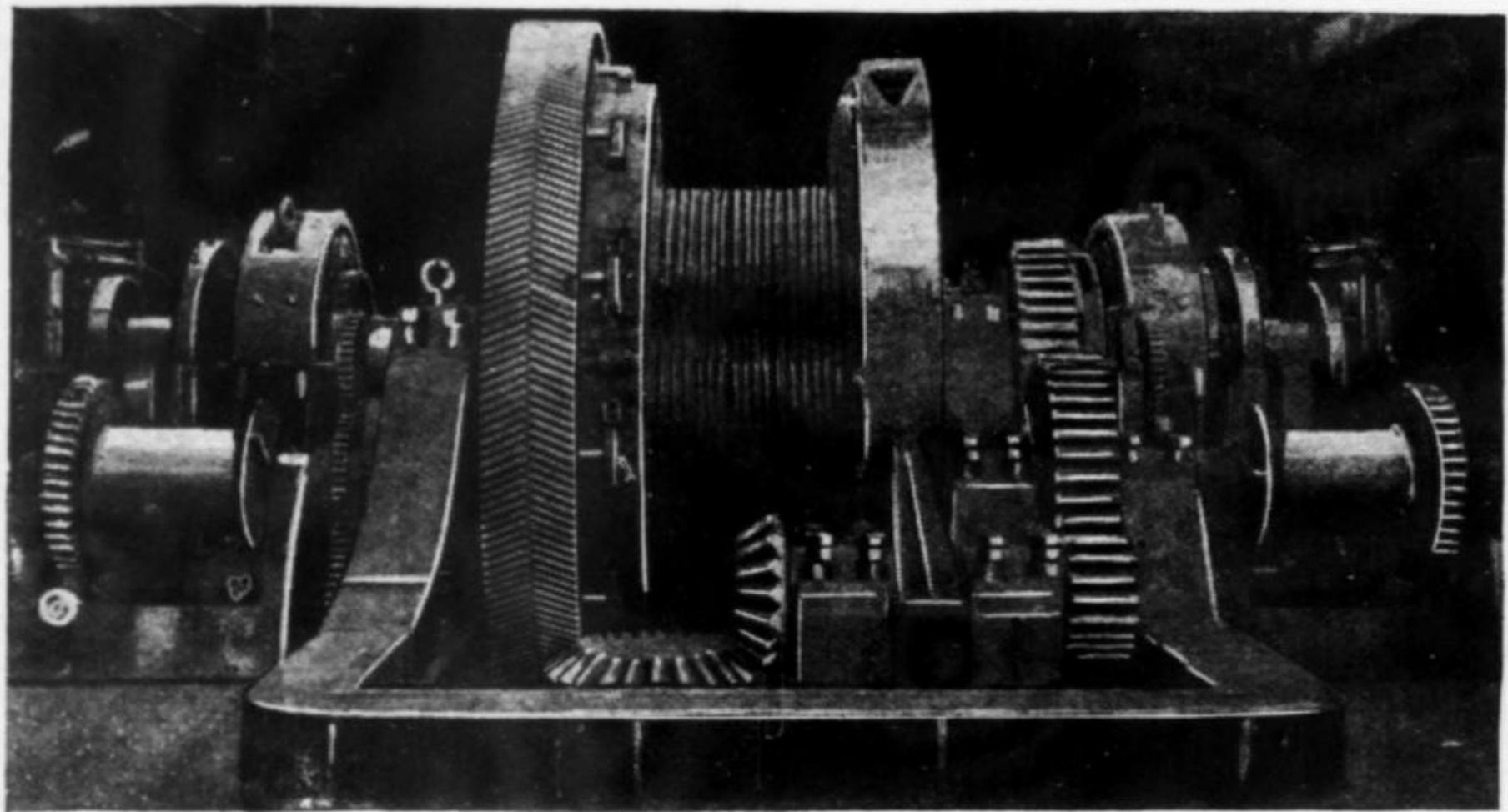
20 Tons of Earth at

IN THE coal fields of Illinois there is being assembled today a huge mechanical shovel with a dipper capable of filling



a gondola freight car in two "bites"—a shovel which will weigh 1700 tons, which will move a load of earth 500 feet in a matter of seconds, which will rise as high as an 11-story building, and whose electric motors will develop nearly 6000 horsepower from its 4400 volt power line. It will be nearly twice as large as the biggest shovel yet built, and its relation to the ordinary garden variety of steam shovel commonly used in construction work will be about the same as that of the Leviathan to a rowboat. It will be used in removing the overburden of 70 feet of earth which covers the coal fields of Illinois.

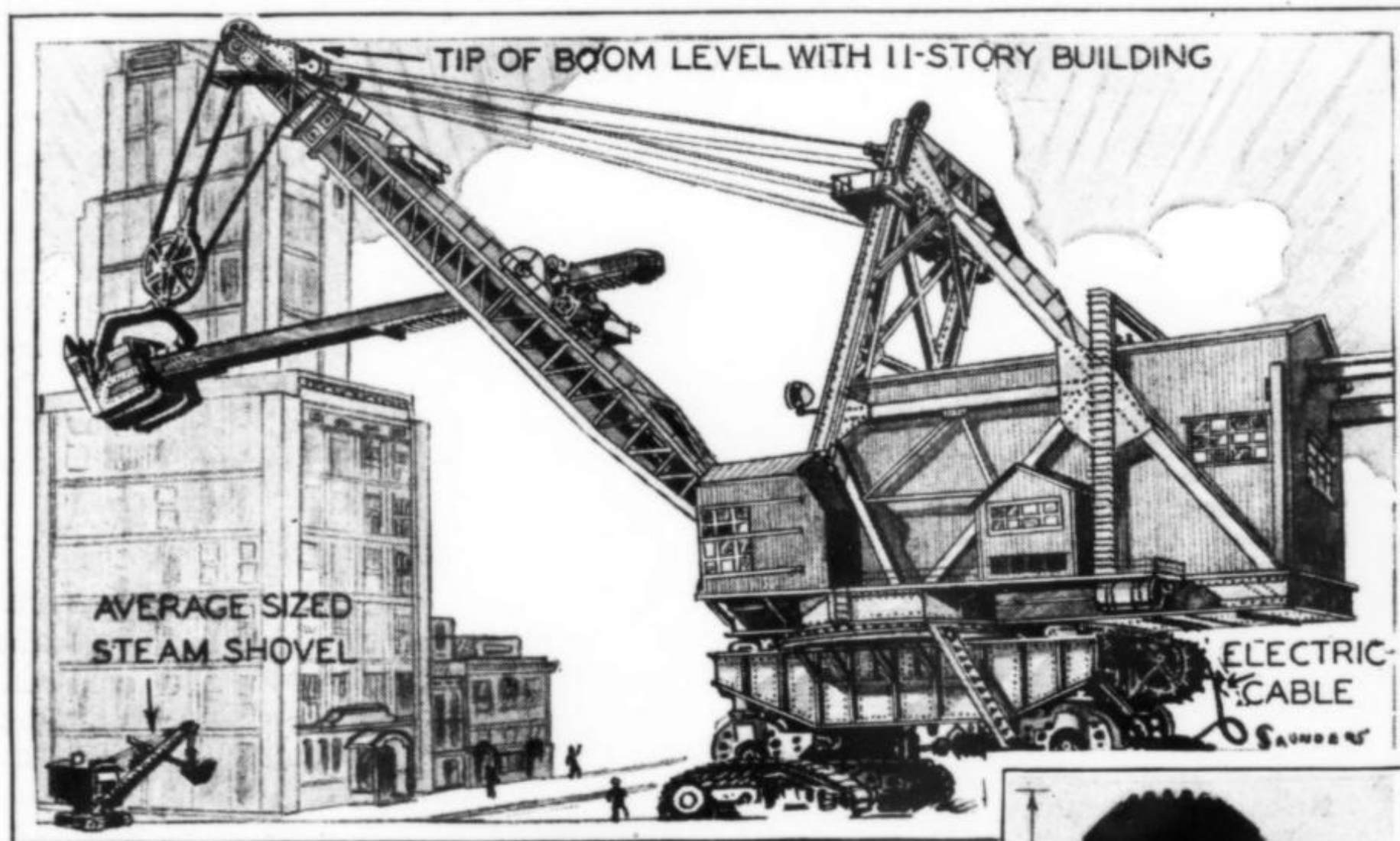
To bring home the tremendous size of the shovel, here's what it will do: its dipper will swallow your whole back yard and transport it a full block down the street before you are aware of it. Motive power is furnished from high tension lines running to within 1000 feet of the shovel, and from this distance a four-inch cable wound over a drum, much the same as garden hose, carries 4400 volts of alternating current to the control board. This board controls, by means of push buttons, six motors which operate various parts of the shovel.



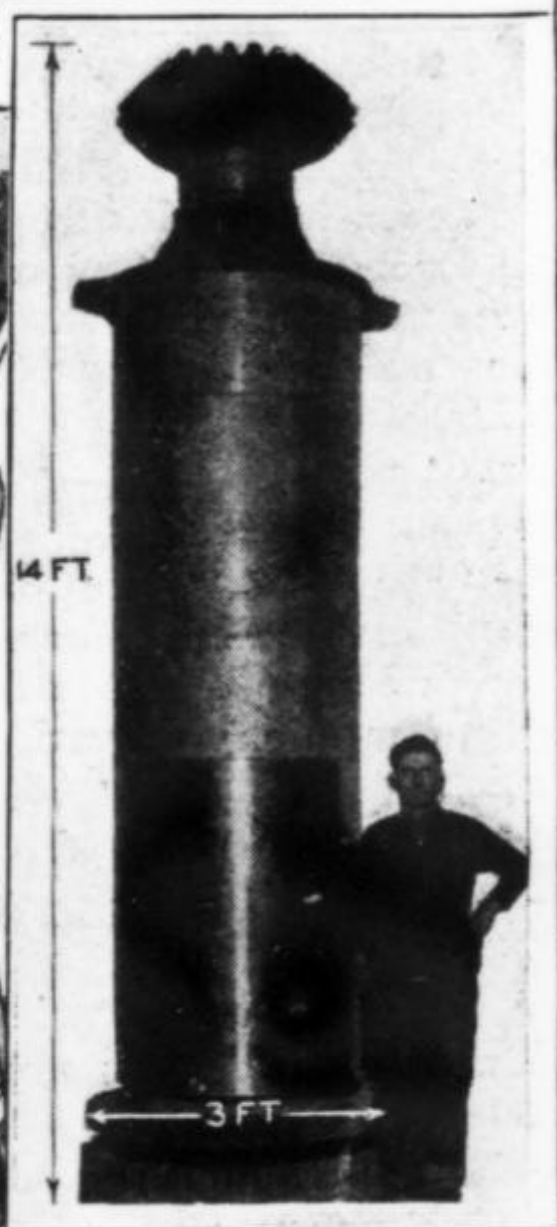
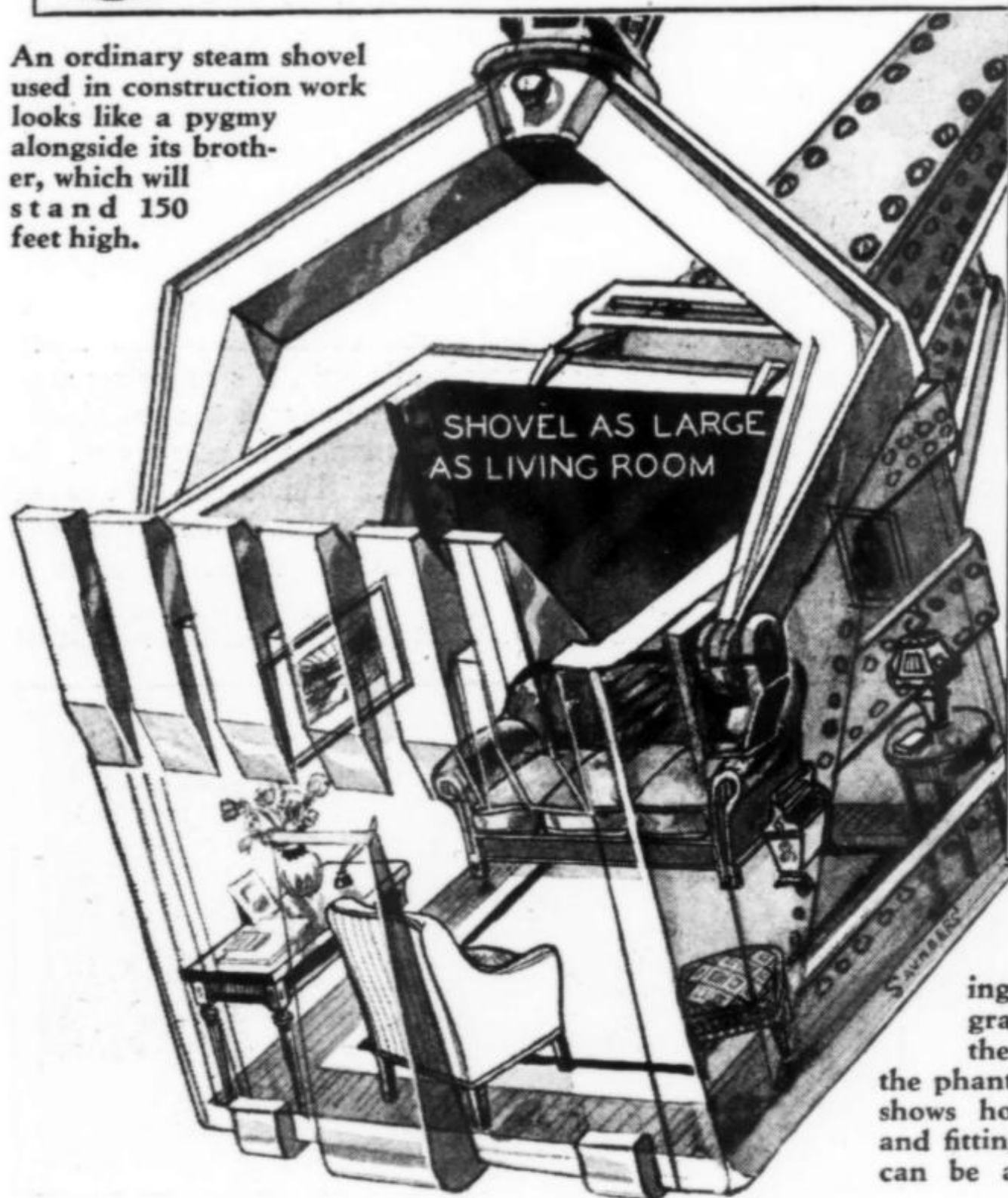
The huge shovel crane shown in the top photo weighs only 925 tons as compared to the 1700 tons of its big brother under construction. An idea of its size can be gained from the tool building in the foreground. The large photo below shows the hoisting mechanism which will control the dipper.

ONE BITE

A 1700-ton shovel, to be used in stripping earth from surface coal veins, has a boom 150 feet high, dips 20 tons of dirt at a time.



An ordinary steam shovel used in construction work looks like a pygmy alongside its brother, which will stand 150 feet high.

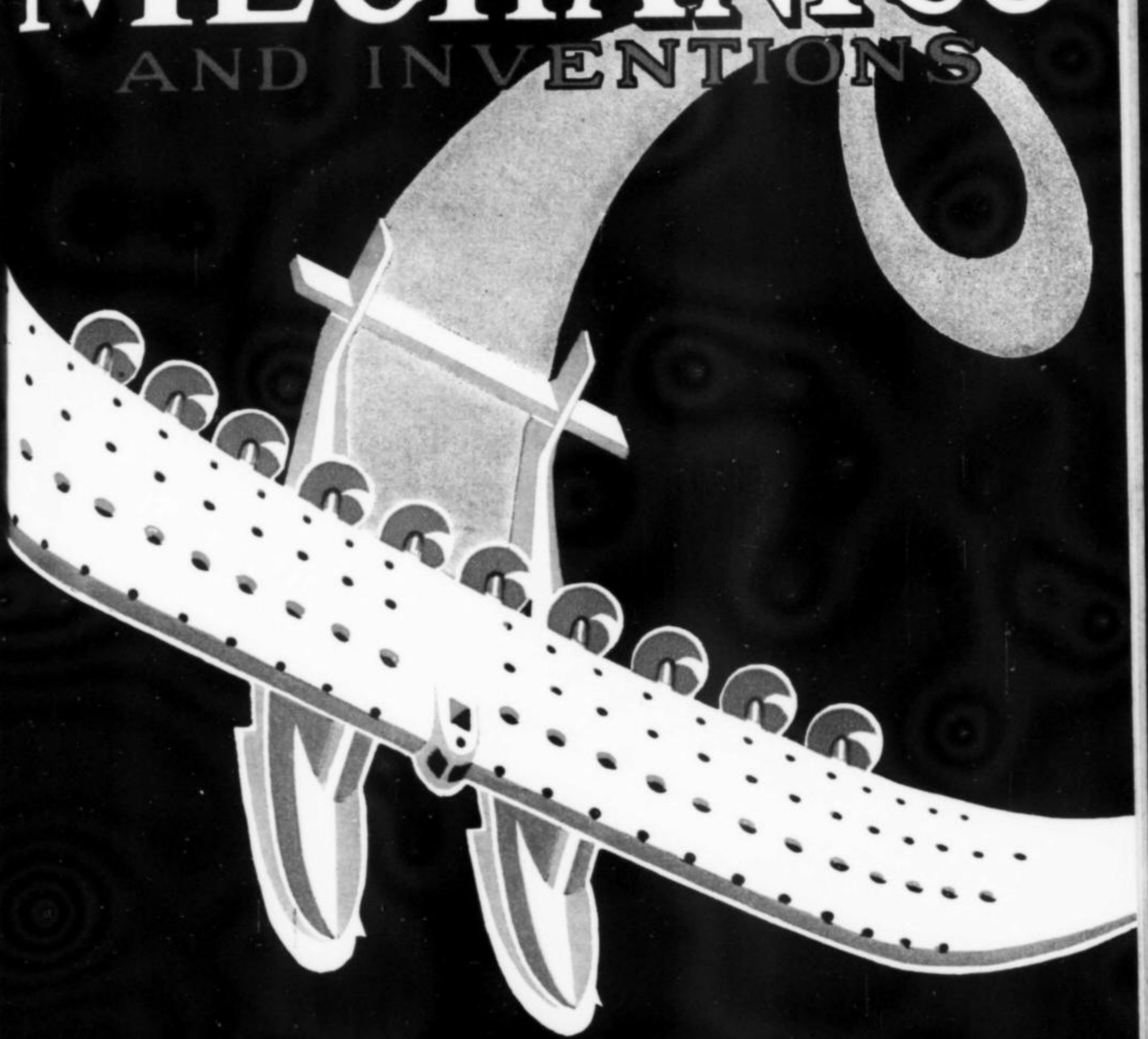


Above is shown the main pin for driving the hoisting drum. The workman standing alongside it is six feet tall. A graphic conception of the size of the huge dipper is afforded by the phantom drawing at the left, which shows how comfortably the furniture and fittings of a good sized living room can be accommodated by the shovel.

MODERN MECHANICS

AND INVENTIONS

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**AIR BATTLESHIPS
OF OUR NEXT WAR**

By Lt. COMMANDER ROSENDALE

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March, 1929

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AND INVENTIONS

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Air Battleships of Our



C. E. Rosendahl

WHAT will be the appearance and design of the floating liner of the air by the year 1950? What will support it and drive it through the air at the high speeds required to cover the vast distances on its route over land and sea? How many passengers may travel from continent to continent high above the earth within the course of a few hours? How will giant airships serve to defend the country in time of war?

An era of experimentation is about to produce practical results. On the basis of knowledge and experience gained in the construction of pioneer ships, it is possible to predict—with a fair degree of accuracy—the future of the airship.

Problems which have long confronted experts are now being solved and will result in marked changes in the speed, shape of hull, type of propellers, motors, struc-

Lieut. Com. Rosendahl, who commands the Navy dirigible *Los Angeles* and who was one of the survivors of the ill-fated *Shenandoah* when it collapsed four years ago while flying over Ohio, speaks as a recognized authority on lighter-than-air craft in making the startling predictions of aerial developments which appear in the pages below.

tural design and terminal facilities.

There will be, of course, differences in engineering detail between a large passenger ship and a military ship. Facilities for passengers and freight will be replaced by the grimmer things of war, machine guns, bomb racks, and aerial torpedoes. Just as a kangaroo carries her young, the giant of the air will carry within the ship airplanes that may be released or picked up at will.

In peace time these planes will serve to load and unload passengers and mails while the mother ship is in flight. In war these planes will serve both for attack and defense.

A fleet of airships for patrolling, scout-



Next WAR

by Lieutenant-Commander
C. E. ROSENDAHL



ing and reconnaissance duty at sea will prove an invaluable arm of our naval forces.

As a protection against airplanes the airship would carry machine guns and even light artillery mounted on top, in the nose, in the tail and in the control car. Filled with the safe helium gas, the puncture of several gas cells by machine guns or shells would do little harm. The airship with a ceiling of over 20,000 feet can largely avoid anti-aircraft fire and will be able to combat airplanes from a superior altitude.

Military airships of the future will sup-

plement the work of airplane carriers on account of their greater speed and will aid in the concentration of airplanes as needed.

The dangers that the future air liner will encounter will be relatively unimportant. The fire hazard will be almost entirely non-existent, for filled with helium gas the ship may safely ride through lightning, and shell-fire. Pioneer ships such as the *Los Angeles*, the *Graf Zeppelin* and the *Shenandoah* have had their value in solving structural problems.

A ship six times the size of the *Los Angeles* or four times the size of the *Graf Zeppelin*, with a lifting gas capacity of 15,000,000 cubic feet will probably be profitably feasible. This type of airship will be quite different in shape from the *Shenandoah*. The future air liner will be comparatively much shorter and fatter.

This squat construction will give added strength and will enable the craft to with-

Motors of Tomorrow's Airships Will be Mounted Inside the Hull

stand fierce storms. The ratio of diameter to length will probably remain in the vicinity of one to six.

The control car will be built into the structure as far as possible. Passengers' compartments, promenade decks, smoking rooms, and dining rooms will be located along two or more lateral corridors, extending far back along inside the ship.

The value of this improvement of multiple corridors will be readily understood by a simple comparison. Take a single lead pencil and see how easily you can break it in your fingers. Then take two pencils or three pencils, wire them rigidly together and see how much greater is the pressure needed to break them. Similarly the introduction of multiple corridors laid on three

modification. It is quite possible that the present type of aeronautical engine may be replaced by one using oil similar to the Diesel type. Utilizing oil as a fuel rather than special gases or gasoline, will increase safety and fuel may be more easily handled and obtained.

Gear transmissions installed in the engine room will be refinements upon the already highly developed arrangements for easy maneuvering. Reversibility and highly variable speeds will be possible with no more effort than that required to operate a ground vehicle.

Tilting and variable pitch propellers—on which research work is now under way—located just outside the hull, will help force the ship upward or downward as de-

Uncle Sam has already taken a step forward in the development of air battleships such as Commander Rosendahl describes. Contracts have been placed with the Goodyear-Zeppelin Corporation of Akron, Ohio, for two fighting dirigibles which will be the largest in the world when completed—more than two and a half times as large as the *Los Angeles*! They will be 785 feet long, with a gross lift of 400,000 pounds and a horsepower of 4,480. They will have a cruising range of 9,500 miles without refueling, and will develop a speed of 85 miles an hour.

or even four keels greatly increases the strength of the ship.

In attaining ships of greater sizes there will be evolved a new type of framework which renders the crew of the future airship immediate access to every part of the ship for inspection and repair.

This framework will be strong enough to take all stresses without the assistance of wire bracing. It will consist of rings with a sufficient section to afford intercommunication between corridors and to permit the installation of the power plant entirely within the hull.

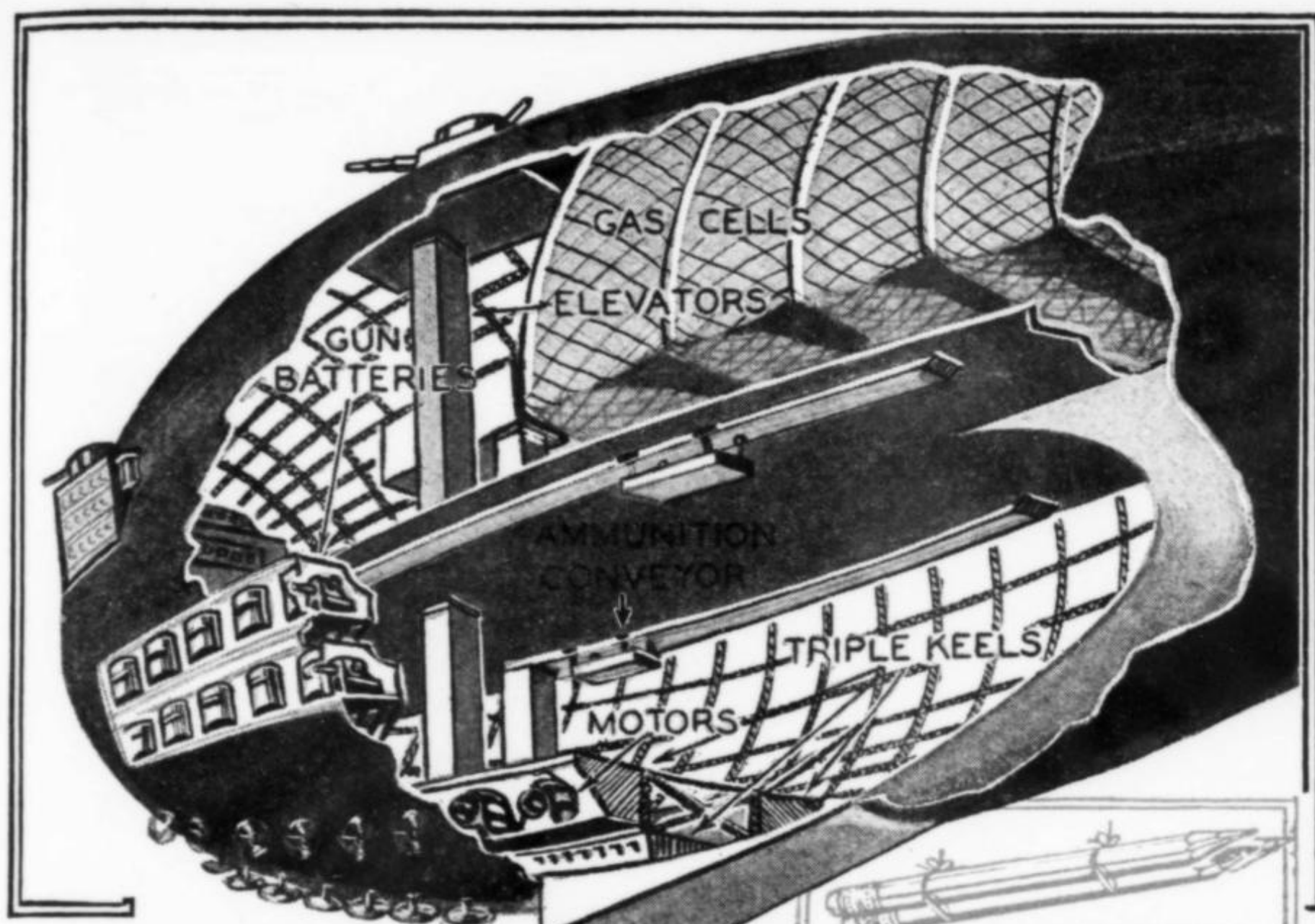
It is doubtful if any helium filled ship constructed after 1935 will have its motors outside the hull. Aside from greater ease in making repairs this arrangement will lower the air resistance to a minimum since only the propellers will project beyond the sturdy lines of the ship's body.

Engines themselves may undergo serious

sired. This feature will be of great importance in starting and landing. It will also permit carrying more paying load and will avoid the loss of lifting gas when the ship has to be forced down.

It is quite possible that a new alloy will prove practicable that is lighter and stronger than that now in use. Electron metal, an alloy of magnesium, is now being investigated in Germany and elsewhere for use in propellers and other special parts.

While experiments are now being carried on in connection with metal covering for the hull, the adoption of this generally for naval and commercial craft will not be in the immediate future. New methods for treating and preserving fabrics and the installation of the improved framework will virtually eliminate present day objections to fabric covering. Eighty per cent of the original fabric placed on the *Los Angeles* is now still in use after five years.



An interior view of one of the gigantic air battleships of the future such as pictured by Commander Rosendahl is shown here. Note the triple keels which will have the effect of strengthening the ship in much the same fashion that binding three pencils together increases their strength many fold.

↑ PLANE
CATAPULT

SHOWING HOW TRIPLE
KEEL GIVES STRENGTH

It is probable however, that the great airships of the future will all have one cover for retention of the lifting gas and a second independent water-proof and fire-proof outer cover to form a smooth surface over the framework.

The multiple cell system for holding the lifting gas will be continued. Difficulties in securing the proper materials for the construction of these cells have been removed by the invention of several cheap substitutes which are being developed to a practical status.

The greatest advance will be in terminal facilities. Large ground crews will eventually become unnecessary. Mechanical handling will enable any ship, no matter how large, to be landed and moored in practically all kinds of weather, within a few minutes.

I believe that the low mooring mast will eventually be adopted generally. The ship, resting close to the ground, will there be subjected to less loads and may be safely

handled by various devices to control the craft horizontally and vertically.

Hangars will eventually be used only as "dry-docks" and constructed in accordance with correct aero-dynamic principles. The revolving platform, on which the hangar can be turned in any direction desired, is thoroughly practical.

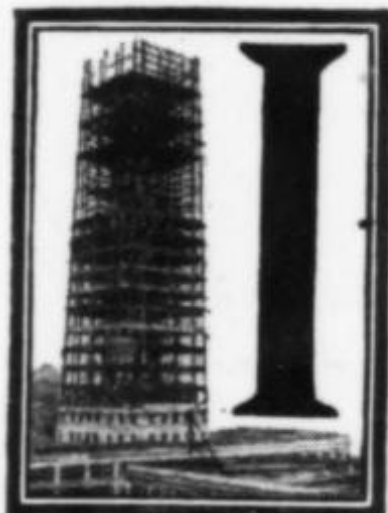
The airship of the future will provide the best in comforts of travel. There will be no dirt, noise, vibration, or smoke, and the motion, when there is any, will usually be a very mild, gradual pitching. There will be ample comforts for reading, writing, card playing, promenades, and luxurious staterooms. The ship's kitchen will furnish as satisfactory a menu as desired.

The cruising speed of the future airship will be about 100 miles per hour. A cruising radius of 10,000 or 12,000 miles is not far distant.

A man could leave New York, Saturday morning, arrive about two days later on

UNIQUE SKYSCRAPER

Built Like a Monument



IN MOST large cities of the United States the municipal authorities have decreed that skyscrapers must be built in the set-back style—that is, the succeeding stories must be set in from the base of the building so that the structure takes on a pyramidal shape. The purpose of this regulation is to prevent towering buildings from turning the city streets into dark narrow canyons by shutting off the sunlight. The set back style of architecture also assures an ample supply of light for the occupants of the building.

One of the most unusual set back skyscrapers in the world is the new Foshay tower, now being built in Minneapolis. The building was inspired by the Washington Monument, and the striking resemblance borne to the famous memorial is well illustrated by the pictures below. It was designed by Magney and Tusler, architects. The tower rises 450 feet above the grade, resting on caissons which go down 60 feet to solid rock. There are 32 stories in the Foshay tower, the upper four of which are devoted to storage purposes and the housing of elevator machinery.

No other office building has slanting walls like the Foshay Tower. The tower measures 86 feet wide at the base and 55 feet at the 32nd floor, which means that the walls slope backward about nine feet from base

to top. Total cost of the structure is slightly over \$2,000,000.

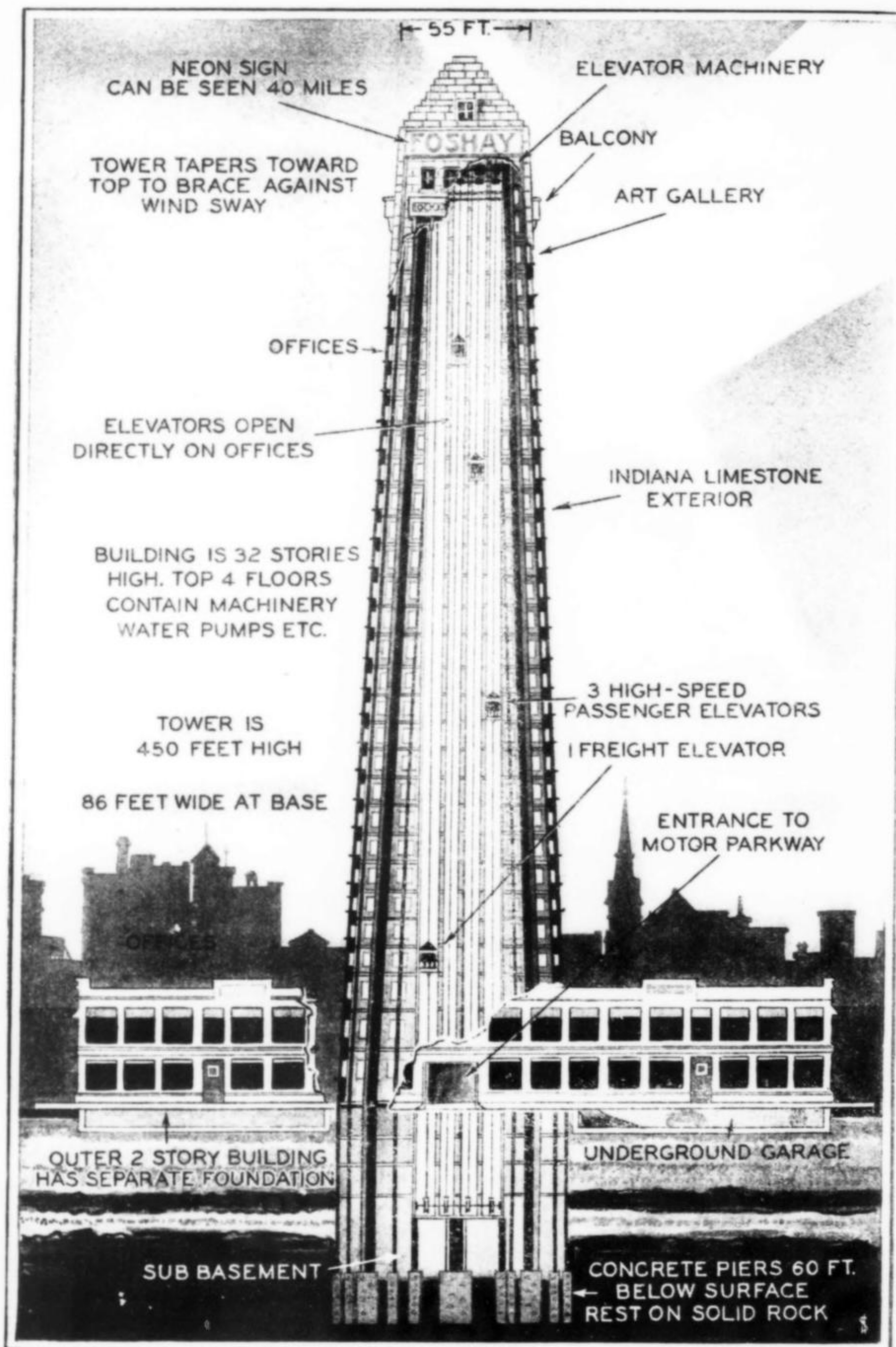
The elevator shaft runs down the center of the building so that each office has an outside window. Being set back in the middle of a block, the occupants of the tower are not bothered with dust and noise from the street.

A garage is provided underneath the tower which is entered by an incline from the street. It is possible to take an elevator from the garage to any office floor in the building.

The unique design of the new building makes it one of the most prominent landmarks in the city. Beacons pointing toward the city's airport are placed atop the structure.

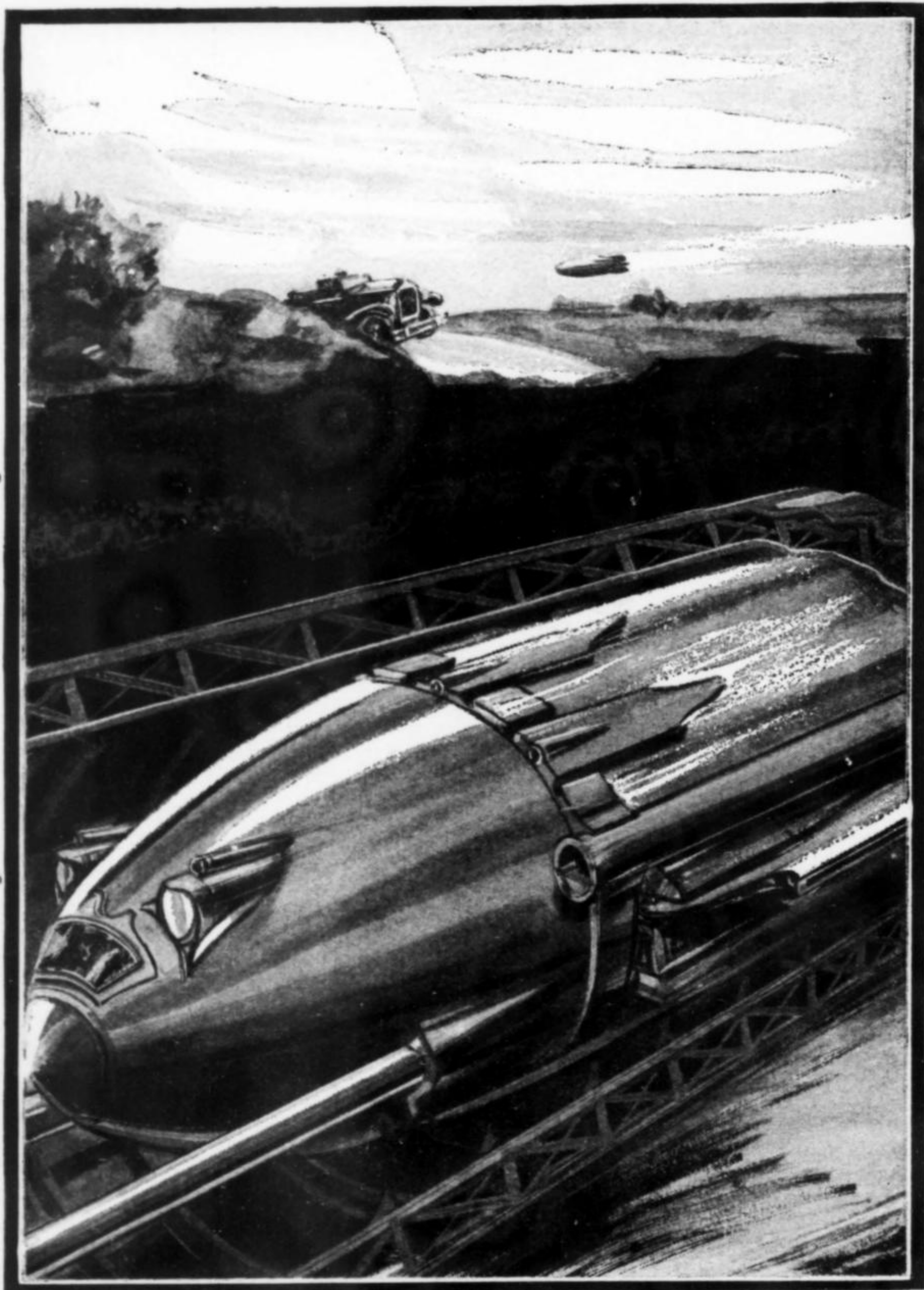


These scale photographs show how closely the Foshay Tower office building has followed the design of the Washington Monument in its construction. The Foshay Tower is 100 feet shorter than the Monument. It is the only office building of its kind in the world.



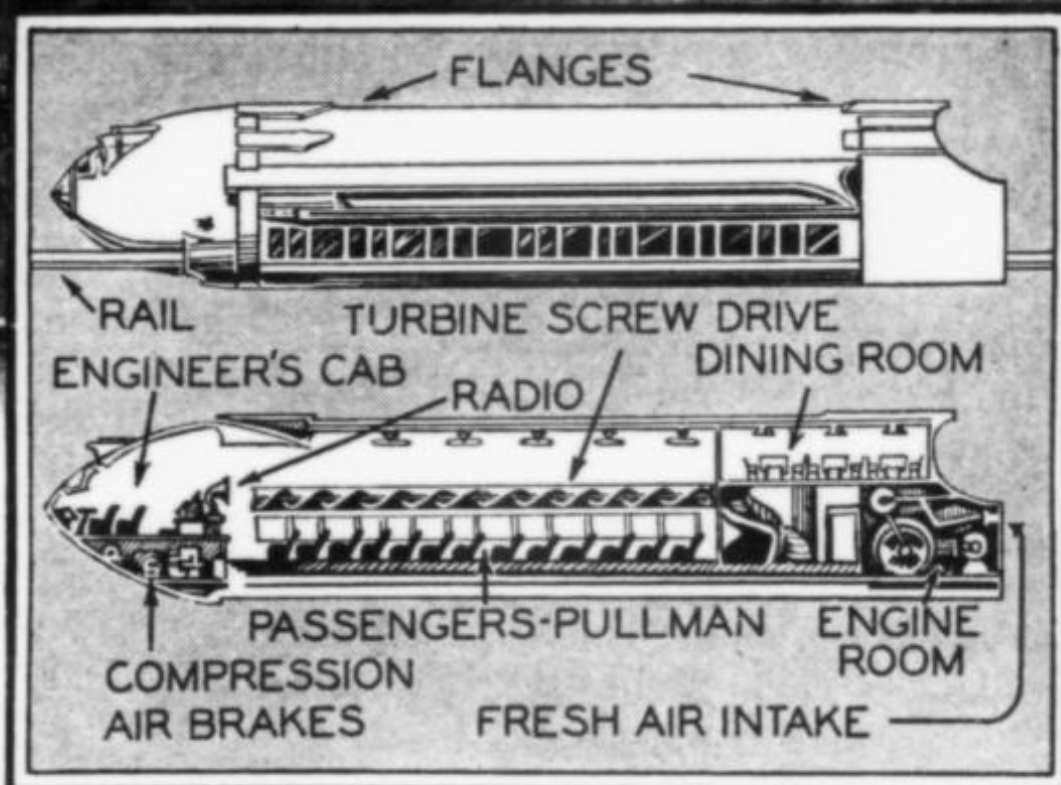
Unique features of a new skyscraper which was recently built in Minneapolis, Minn., are shown here. Note the elevators in the center, separate foundation and outer 2 story building which runs to the street line, and underground garage.

Vacuum Tube Railway to



Above is the artist's conception of the 400-mile-a-minute vacuum tube railway proposed by a Los Angeles engineer. It is based on the familiar principle employed in the change-carrying boxes commonly employed in department stores.

Travel 400 Miles a Minute



The almost incredible speed of four hundred miles a minute will be a commonplace rate of travel in the future if the novel vacuum tube railway designed by Bertram Longworth, of Los Angeles, proves practicable in service. That there is nothing at all fantastic or impossible in the design of this railway, as illustrated by the drawings herewith, is demonstrated by the fact that the vacuum tube method of carrying money and change is an accepted procedure in all up-to-date department stores.

Mr. Longworth proposes an underground

tube through which a great shuttle accommodating 150 persons will slide, propelled by air pressure created by pumping stations every hundred miles along the route, which create a vacuum in front of the car. A constant spray of oil in front of the shuttle car will lubricate its pathway. Seven miles per second, or 420 miles per minute, is an entirely feasible speed over a straightaway course.

Details of the interior arrangement of the vacuum car are shown in the inset above. The shuttle would slide on rails of special alloy which would keep it on its course without twisting about in the tube due to the tremendous speed at which it would travel.

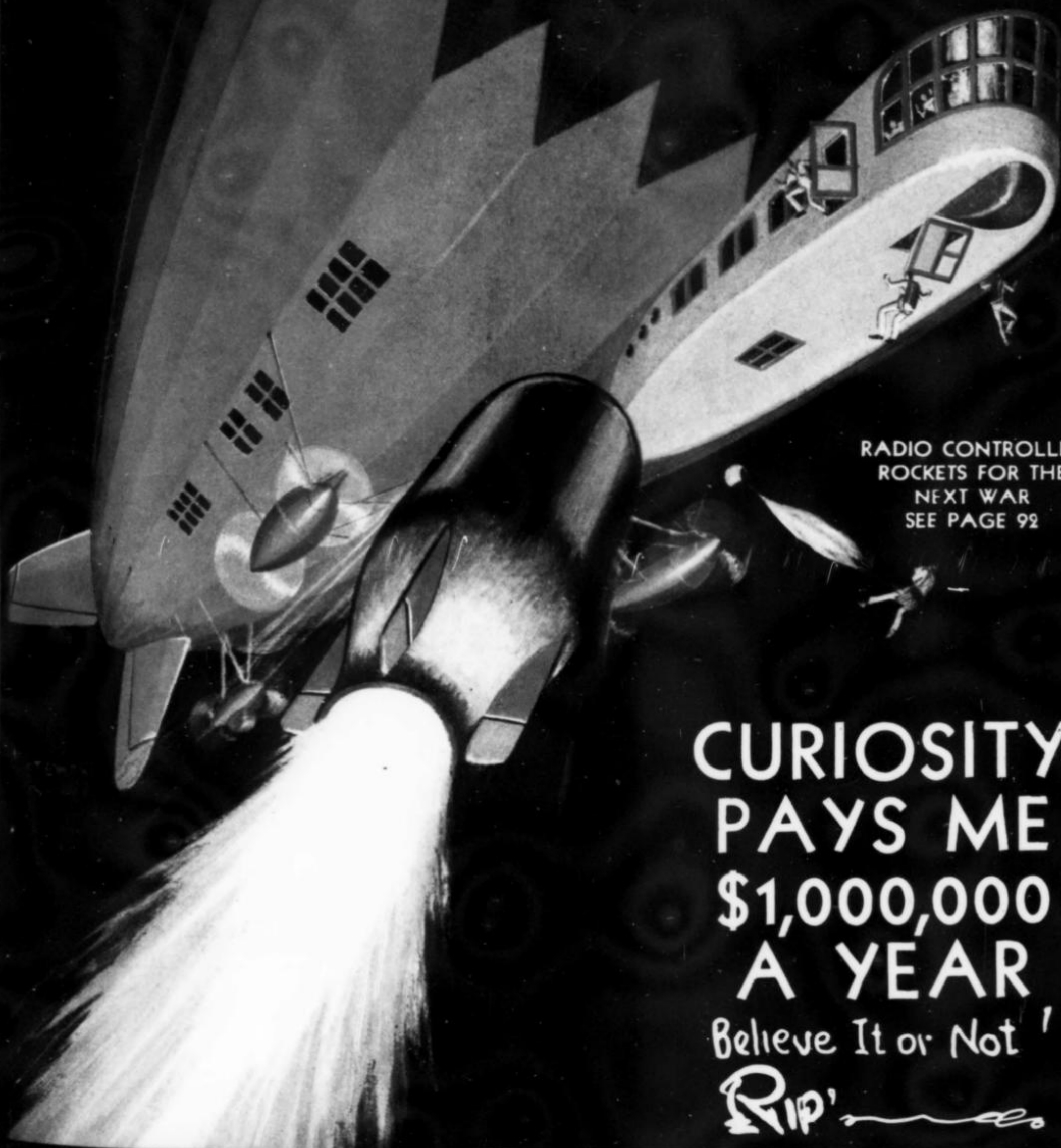
FAWCETT'S

VOLUME

25c

MODERN MECHANICS

AND INVENTIONS



RADIO CONTROLLED
ROCKETS FOR THE
NEXT WAR
SEE PAGE 92

CURIOSITY
PAYS ME
\$1,000,000
A YEAR

Believe It or Not!

Rip' *[signature]*

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Radio-Controlled Rockets

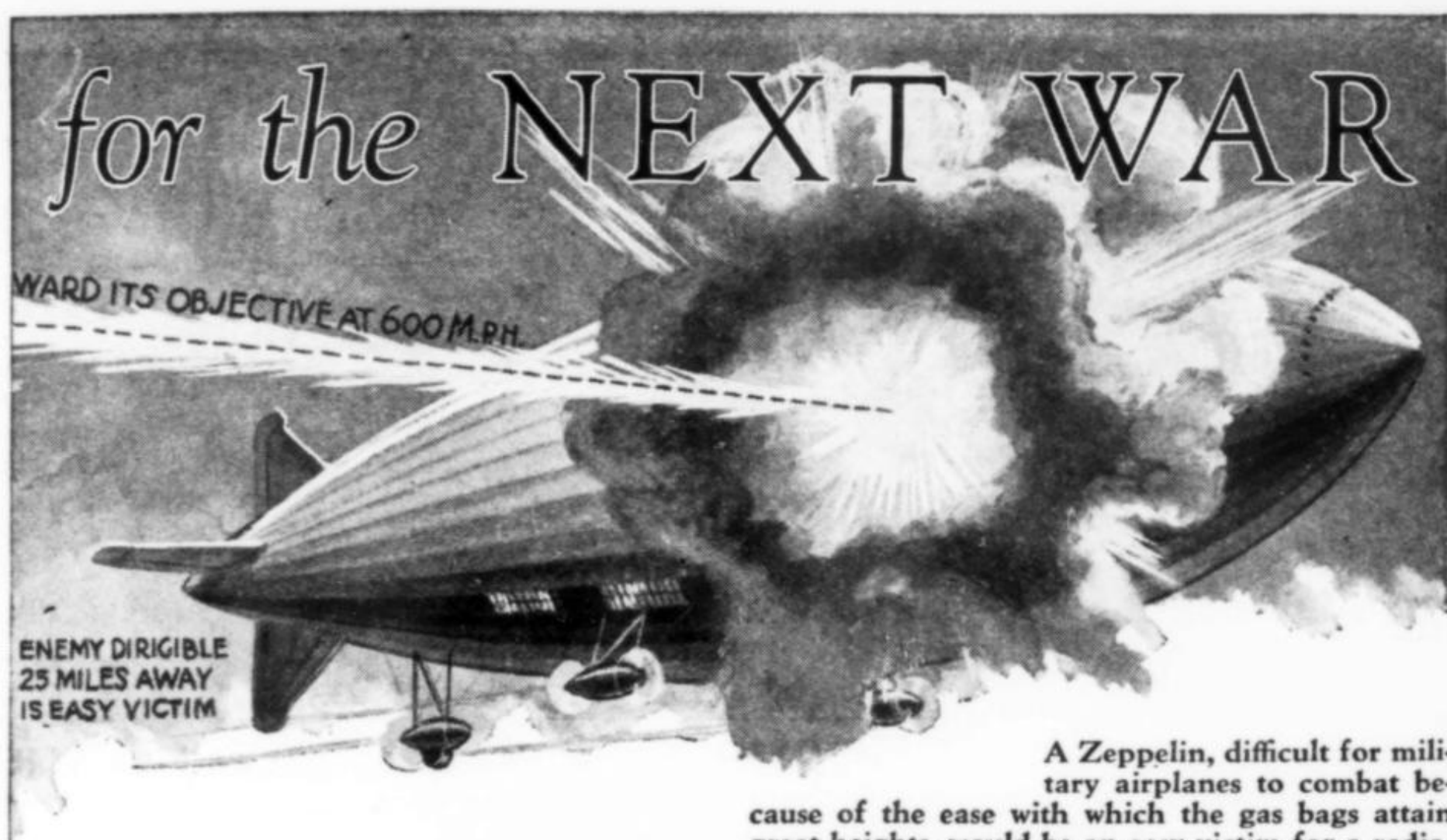


A DVANCES in the perfection of radio control for airplanes, tanks, and battleships have made it practically certain that the next war will see the use of these fearsome weapons of destruction in actual combat. Latest of the radio-controlled death-dealing devices is the explosive rocket depicted on this month's cover of *MODERN MECHANICS AND INVENTIONS*, now being secretly developed. Naturally photographs and intimate details of construction are not available, owing to the extreme care with which military secrets of this nature are guarded, but the drawings on these pages illustrate the essentials of a radio-controlled rocket.

Fantastic as it may appear at first glance, there is nothing impossible or even improbable in the idea of an explosive shell, propelled by rockets, being steered by radio waves to a distant target. Experiments of Prof. R. W. Goddard of Massachusetts, and others, have proved the rocket method of propulsion practical. Automobiles and other vehicles have been successfully controlled by radio. All that remains, therefore, is a satisfactory application of known principles to produce a radio-controlled rocket.

Rocket speeds can be varied according to the nature of the fuel charge and frequency of explosion. Powder, liquid air, and other fuels give varying results. A speed of 600 m.p.h. is sufficiently

Method of launching explosive rocket from mortars and controlling its flight by radio is graphically shown in these drawings.

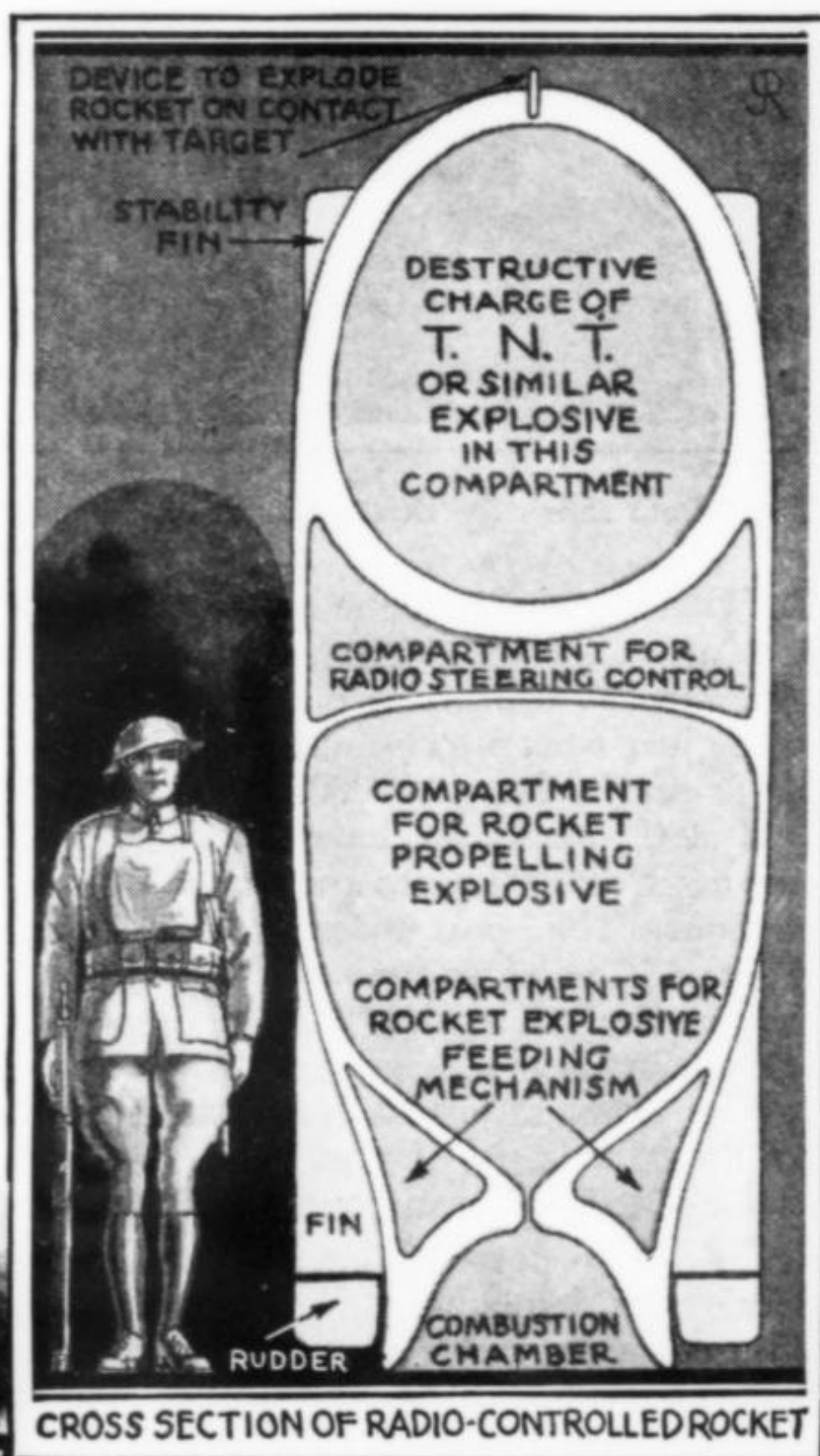
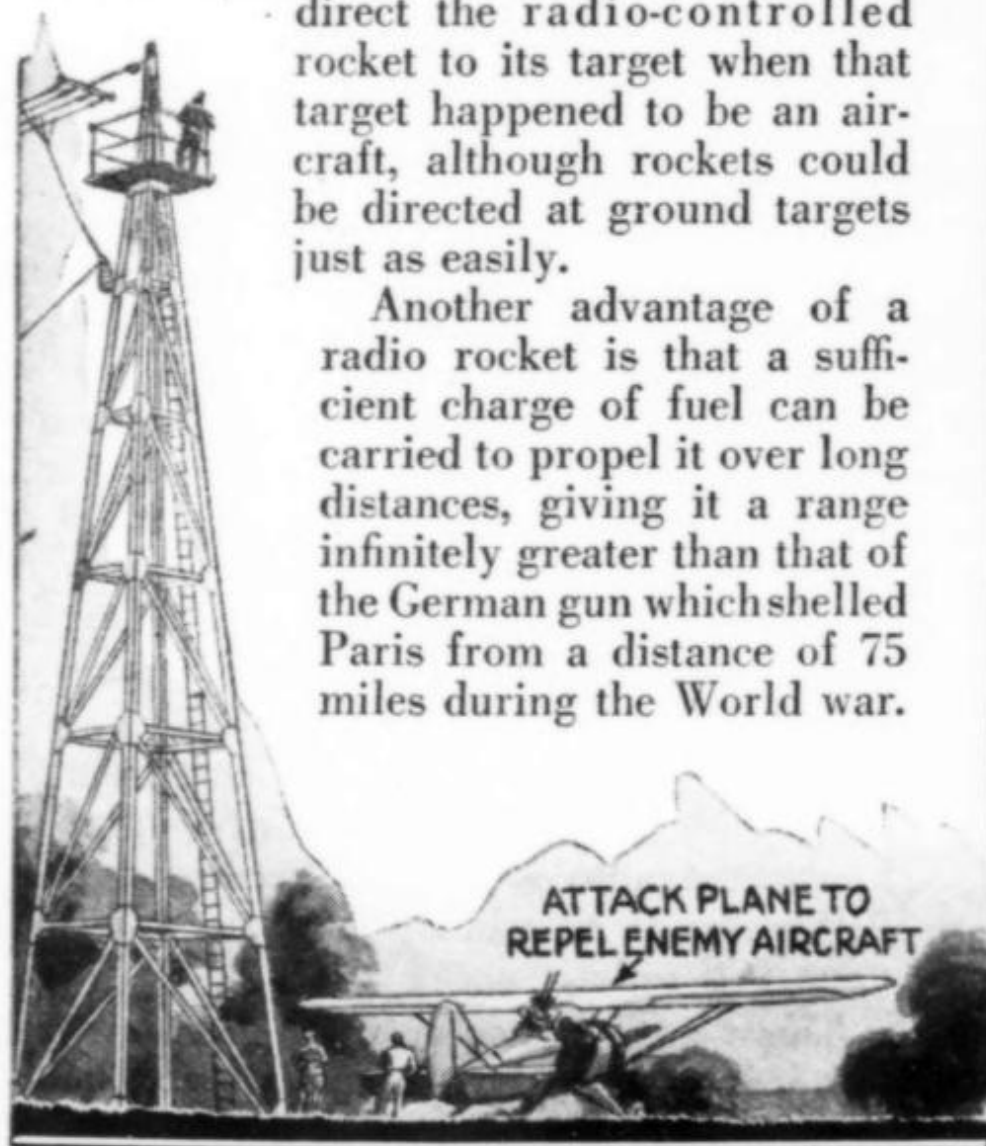


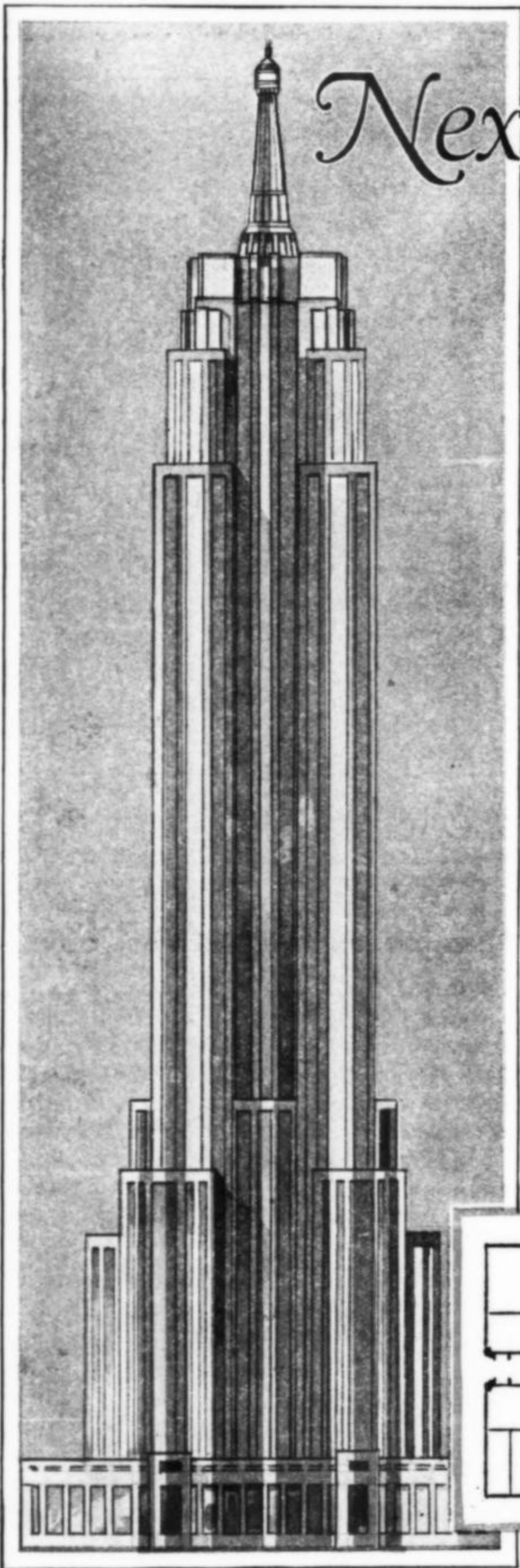
A Zeppelin, difficult for military airplanes to combat because of the ease with which the gas bags attain great heights, would be an easy victim for a radio-controlled rocket, which could be turned around and steered back into the airship in the event of an initial miss. The diagram below gives an idea of the general arrangement of parts of a radio rocket.

slow to enable officers to follow the course of the rocket, and fast enough to render it impossible for a Zeppelin or airplane to dodge it. Mortars would likely be used in launching rockets, in order to avoid danger to ground crews. After reaching a height of 1000 feet or more, the rocket propellant would be ignited and radio control established. Ordinary control fins like those on an airplane would suffice to steer the rocket.

Range-finders or "electric ears" like those employed with anti-aircraft guns would direct the radio-controlled rocket to its target when that target happened to be an aircraft, although rockets could be directed at ground targets just as easily.

Another advantage of a radio rocket is that a sufficient charge of fuel can be carried to propel it over long distances, giving it a range infinitely greater than that of the German gun which shelled Paris from a distance of 75 miles during the World war.





Next-100-Story

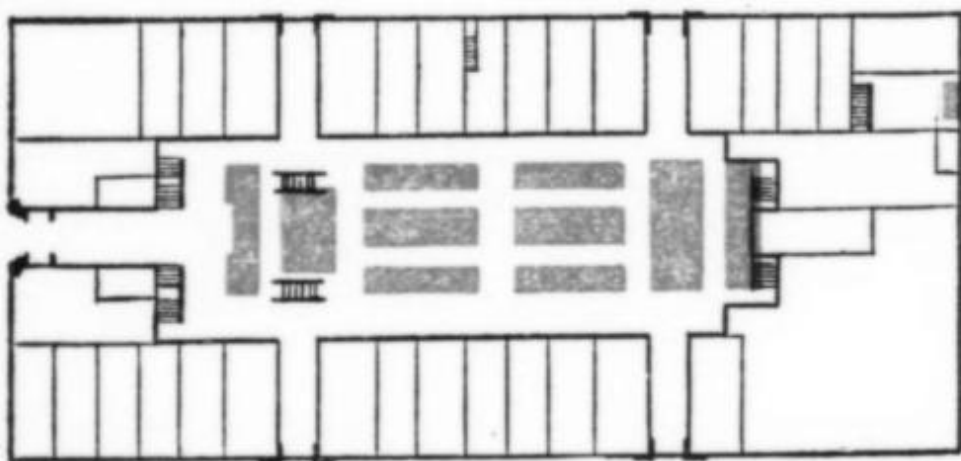
by BEVERLY BARNES

Buildings rising two hundred stories into the air are now within the realm of possibility, but with the present limitations they would be mere towers housing elevator shafts. Ingenious methods of vertical transportation, such as placing two elevators in one shaft as described below, may make the sky the limit.

HUNDRED story buildings, dwarfing the 88 story Empire State building, now rising on the site of the old Waldorf-Astoria Hotel, are visioned as a reality in the near future by business men of New York.

To make that vision possible they have petitioned the city to amend the building code to permit elevators to travel at 1400 feet per minute, instead of 700 feet, the present limit, and to permit double deck elevators or two separate elevators in one shaft.

Curiously enough the elevator, a comparatively modern invention, is the only limiting factor on how high a building may go. Solve the elevator question and 100 or even 200 story buildings are quite possible. The trouble is to get an elevator system that will be fast enough to move the traffic and will not take up so much valuable space as not to leave enough rentable area to earn a respectable income on the investment.



A profile of the 1243-foot Empire State building, showing how the banks of the numerous elevator shafts take up a large percentage of space.

A ground floor plan of the world's tallest building is shown above, revealing how the banks of sixty-six separate elevator shafts consume more than one-fourth of all the available floor space. Two elevators in one shaft reduces parasite space.

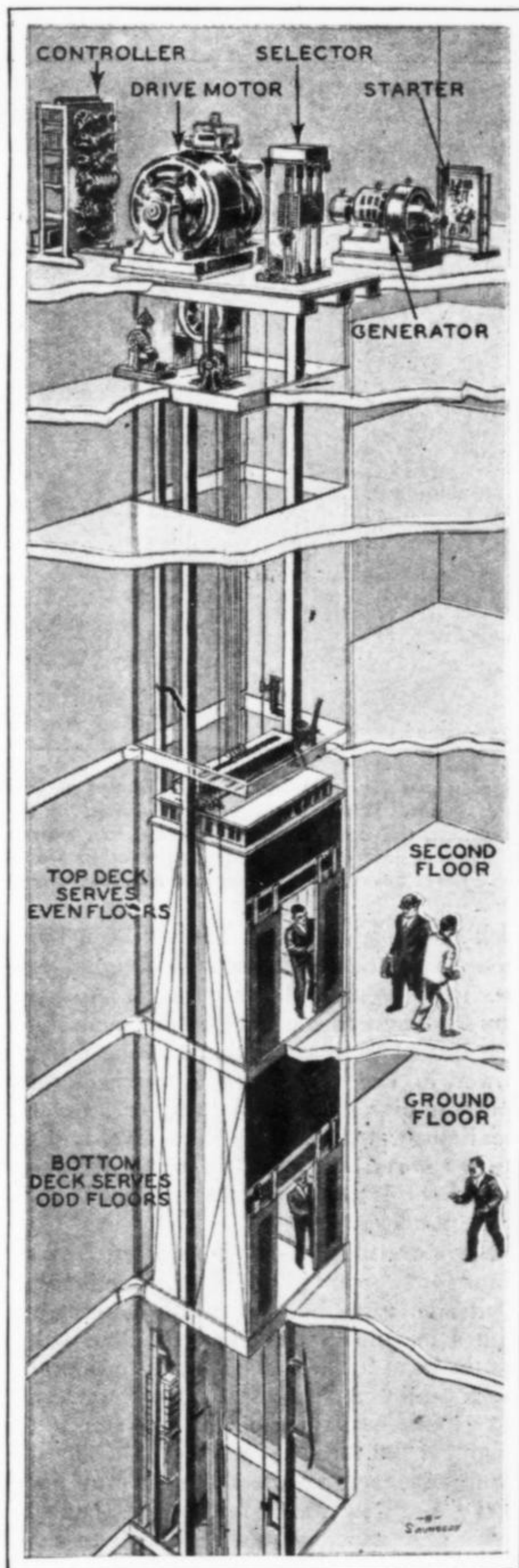
BUILDINGS

If you want some idea of how much space the elevators of a modern skyscraper take up, look at the ground plan of the Empire State, the 1243-foot super-skyscraper rising under the guidance of former governor Al Smith. The huge pile has a frontage of 197 feet 5 inches on Fifth avenue and 424 feet 9½ inches on 33rd and 34th streets, occupying the entire block between them. But virtually one-fourth of all that ground area is taken up by the elevator banks and their hallways. Of course, as the building ascends, the shorter shafts, locals and lower express banks, come to an end, but the building set-backs also reduce the available renting area in more than equal proportion.

It will take sixty-six elevators to serve the world's tallest man-made structure—sixty-seven when the elevator is installed in the dirigible mooring mast on the roof, a mast whose tip will be 243 feet higher than the famed Eiffel tower in Paris. Eleven of them, ten passenger express cars and one freight, will rise as high as the 80th floor, the ten express cars traveling 951 feet, while the freight elevator, which descends into the sub-basement as well, will have a vertical rise of 981 feet. The upper tower floors, from the 79th to the 86th inclusive, will be served by local cars.

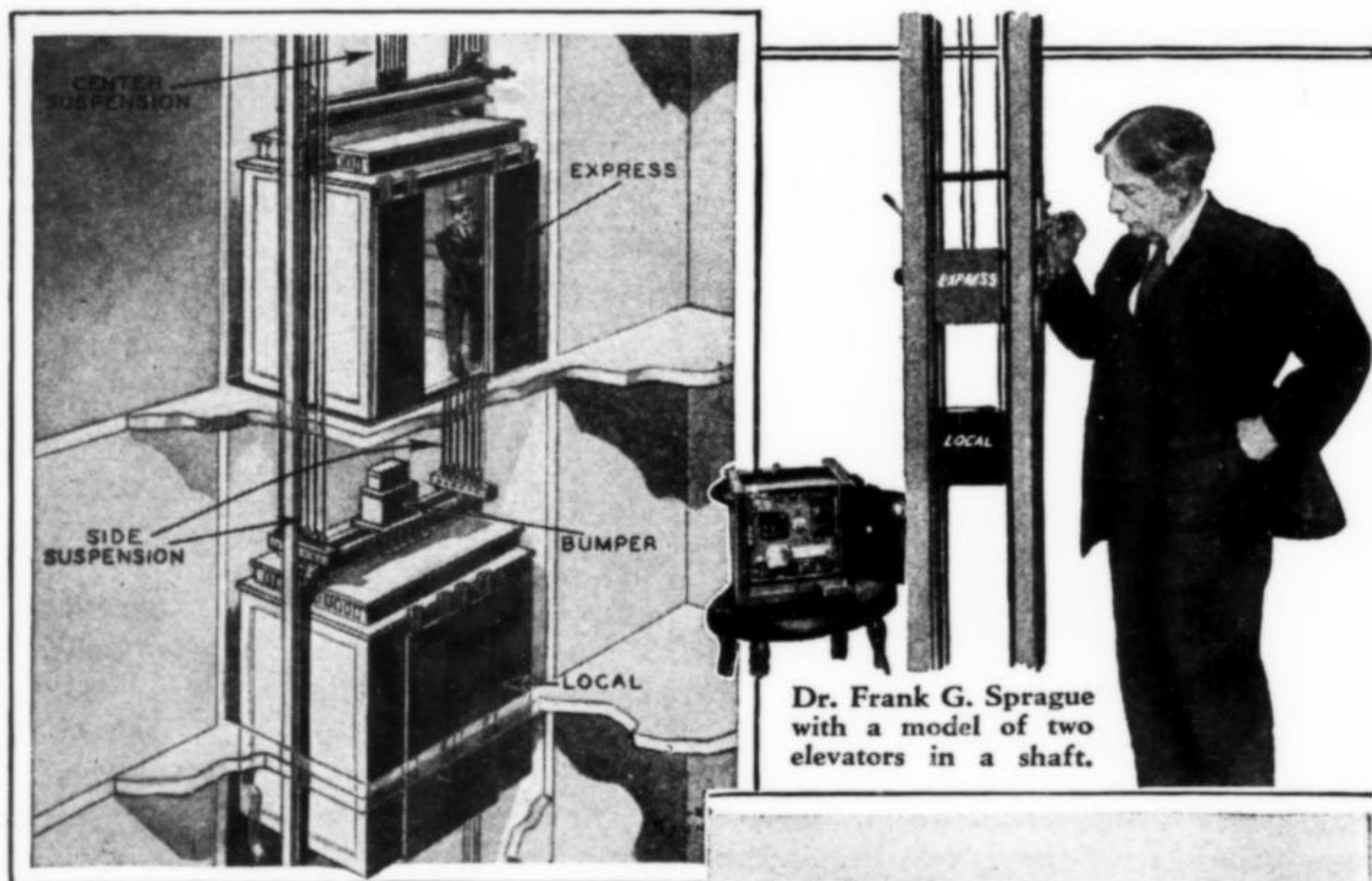
There are fifty-eight passenger cars in the various express and local banks at the ground level, and two cars in the tower shafts. All the ground level cars are designed to travel at the maximum speed now allowed—700 feet per minute—but provision is made in their mechanism to speed them up when and if the law is changed. If that happens the ten traveling express to the 66th floor and local from there to the 80th level will move at 1200 feet per minute. Eighteen serving the floors between 24 and 43 and 41 and 57 will be speeded up to 1000 feet per minute, and another eighteen to 800 feet. Only four locals, serving floors from the first to the seventh, will continue at the 700 foot speed.

The suggestion of the New York business men that two story elevators, serving two floors at the same time, and two elevators in one shaft be permitted opens up a whole new field of vertical high speed travel. No two



This is how the double deck elevator would work. All floors would be the same distance apart, the decks serving alternate floors as shown above.

Two Elevators in One Shaft Will Speed up the Service and Save Space



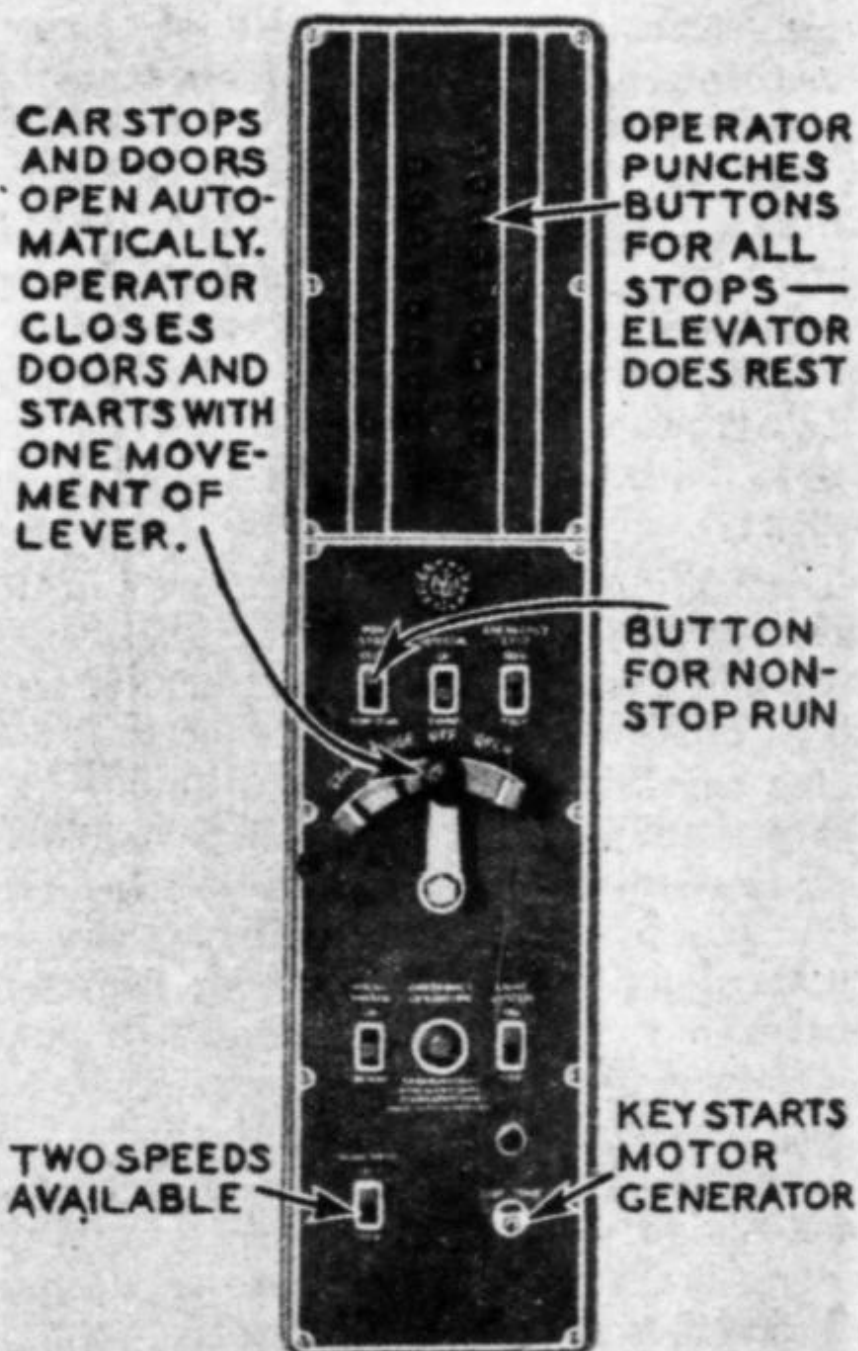
Dr. Frank G. Sprague with a model of two elevators in a shaft.

Placing two elevators in one shaft is not as wild as it seems. While the lower car waited in the basement, the upper would load and run express to the top half of the building, the other would serve lower floors. Note center and side suspension.

deck passenger elevator has yet been built, though two and even three deck freight elevators have been built for garages. And two cars have never been hung in the same shaft. The nearest approach to that is in the Tribune Tower in Chicago where a tower elevator operates directly over a local car, but the local stops at the twelfth floor level and the tower car starts at the 23rd, while the space in between is not an open shaft, but is occupied by offices.

Elevator men have considered several plans for two cars in one shaft. One is to put a pit and safety buffer beneath a tower car, with a machinery floor and sub-floor below for the head of the local shaft. Considerable space would be lost, at least three floor levels, but express cars traveling without stop to the height of the local car shaft, could then deliver passengers to the three or four floors above, and finally transfer the balance to the tower car, which would not have to make the long run down to the ground, and so could better serve the tower floors.

Another idea which the elevator builders are considering is two cars in one shaft, mov-



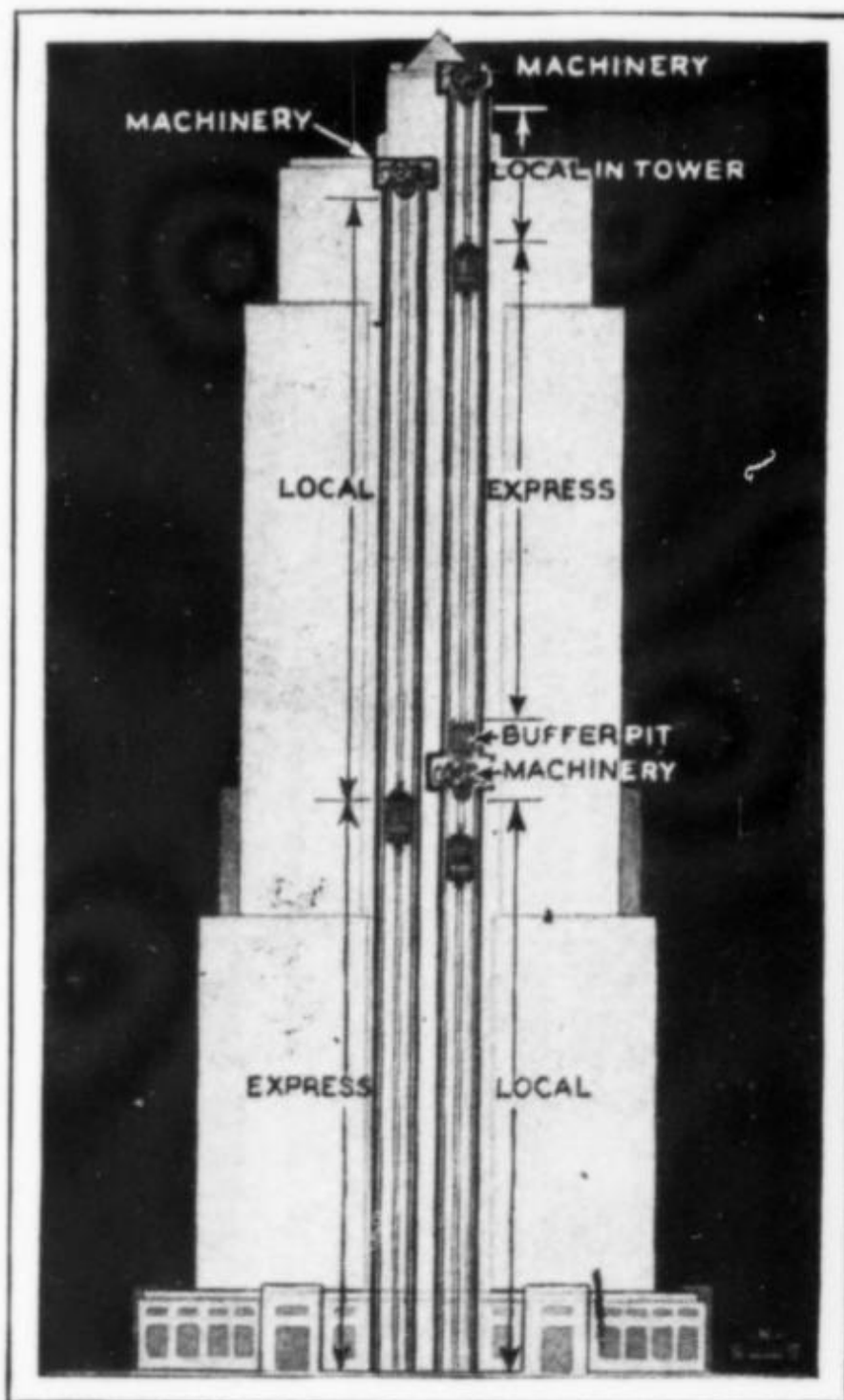
Operator's panel in a signal control elevator. Everything except starting the car is automatic.

Divided Shafts for Local Cars Give Much Better Service to Upper Floors

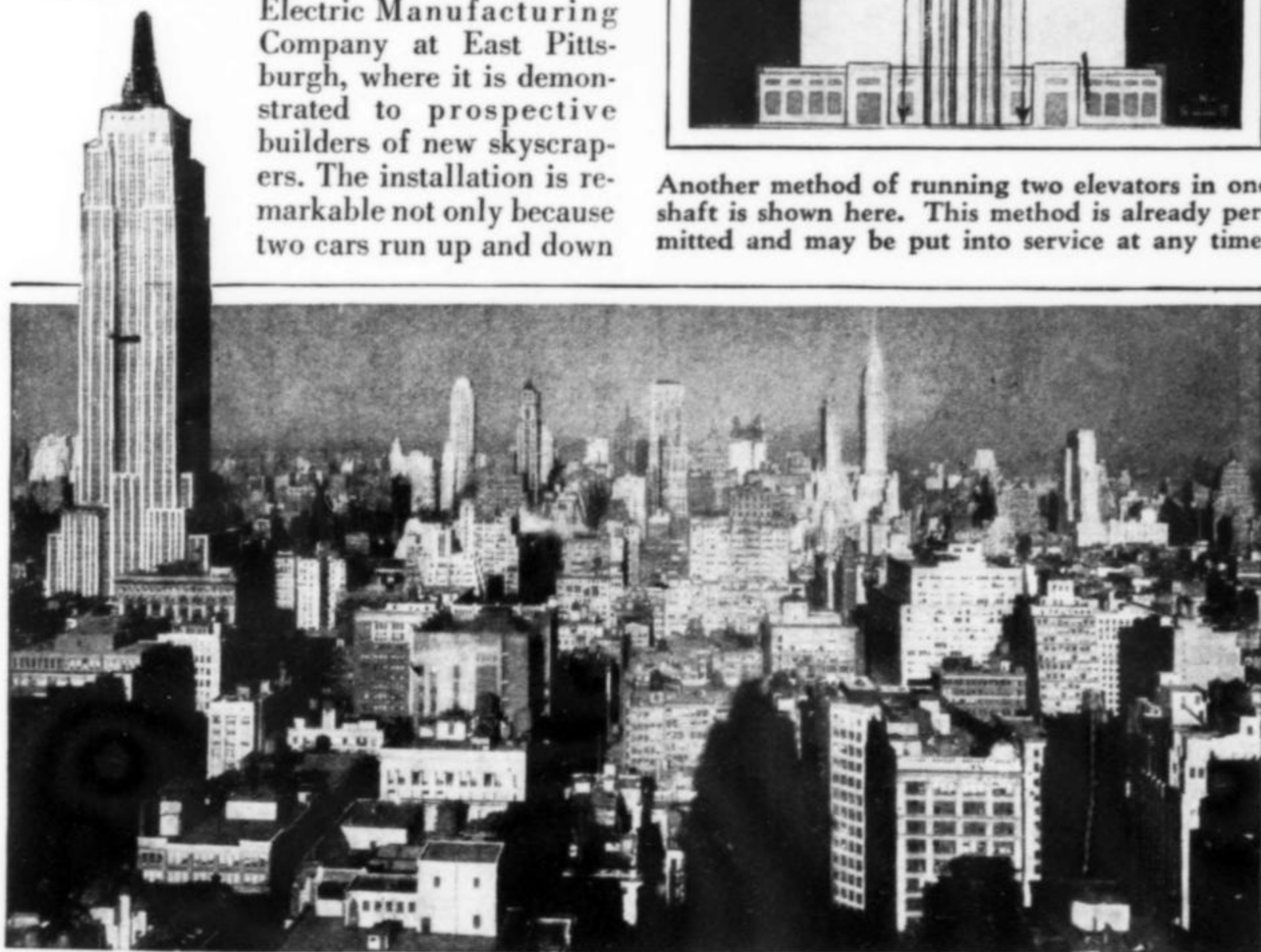
ing independently of each other, but both going all the way down to the ground. That sounds impossible, but, as the elevator builders visualize it, it is quite practical. The upper car would be hung in the usual way, with supporting cables descending down the center of the shaft. The lower car would be hung to a cross beam, supported by cables traveling down each side of the shaft. The local would descend to the basement, while the express stopped at the ground floor to discharge and take on passengers. As the express started upward the local would ascend to the ground, load, and then follow. Coming down the process would be reversed. Safety devices preventing the cars getting too close together or the express car coming down when the local is going up, would be necessary, but they present no particular obstacle. If any city authorizes two cars in one shaft the elevator designers are ready to produce them.

An elevator system of this sort, with two cars running independently of each other in the same shaft, has actually been built and is in operation in the plant of the Westinghouse

Electric Manufacturing Company at East Pittsburgh, where it is demonstrated to prospective builders of new skyscrapers. The installation is remarkable not only because two cars run up and down



Another method of running two elevators in one shaft is shown here. This method is already permitted and may be put into service at any time.



A view of the mid-town skyscraper district of New York, showing how the new Empire State building towers above the surrounding structures. These skyscrapers would be impossible without elevators.

Speed of Elevators Is Limited by Physical Condition of the Passengers



This elevator in the LaSalle-Wacker building in Chicago is the fastest in the world. It is capable of 1,000 f. p. m.

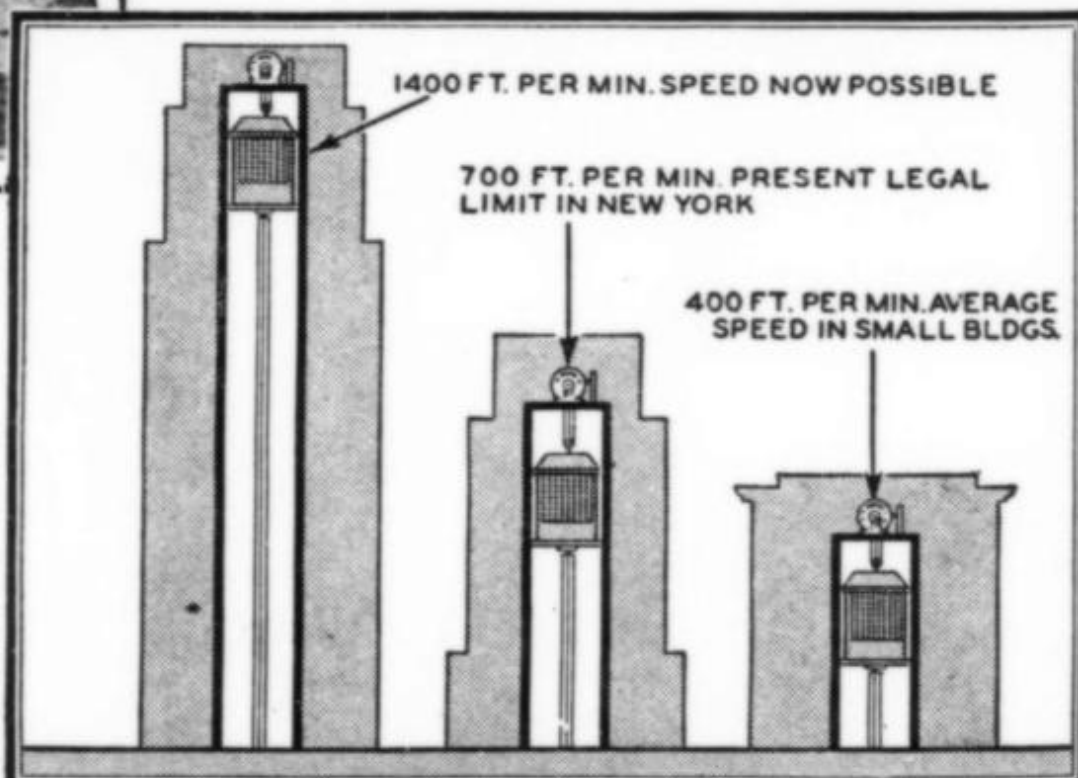
in one shaft, but because the cars are built entirely of aluminum—even to the cross-head beams—with side wall panels of micarta, a lightweight synthetic material used in making airplane propellers.

Safety devices keep the two cars from approaching closer than two floors apart, and also prevent them running toward each other. The ex-

press loads at the main floor and starts up, whereupon the local follows it, loads at the same floor, and continues upward. The arrangement is particularly useful in tall buildings, as the division line between express and local service can be shifted up and down to meet customer demand. If there is unusually heavy business, say, between the 20th and 30th floors of a 40 story building the local cars, which normally would operate only to the 20th floor, can extend their runs to the 30th, so that both cars would serve that section until the peak load period had passed.

The double deck car offers problems that are perhaps more serious. One car would stop only at floors with even numbers and the other at floors with odd numbers. A passenger getting on at one level and wishing to get off at the other either would have to transfer somewhere en route, and walk up or down one floor, or get off one floor before or beyond his destination, and take the stairs. There would be an operator in each car, but the controls would be interlocked so that neither could start the car until the other was ready. And, finally, all floor levels in the building would have to be exactly the same distance apart.

Elevators have developed in the last few years to where they are not only almost human, but in some cases are even better than human operators could be. It was human faults that produced the modern signal control system in which the operator punches buttons before he starts for all the floors where passengers wish to alight, and from there on has nothing to do but close the doors

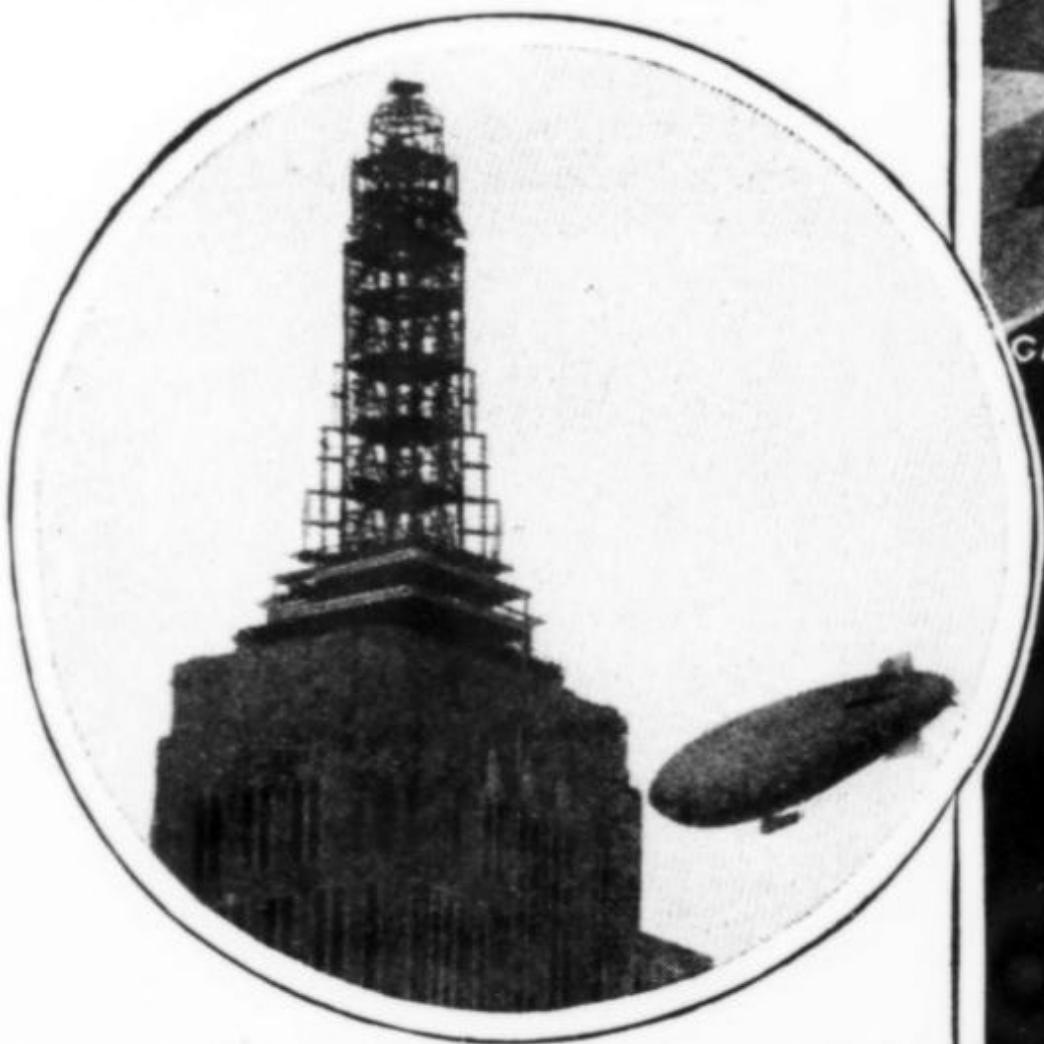


This diagram compares the present speed in smaller buildings with the maximum now legal in New York City and with the highest speed possible with present equipment.

Mooring Mast May Make Empire State Building Atlantic Air Terminal

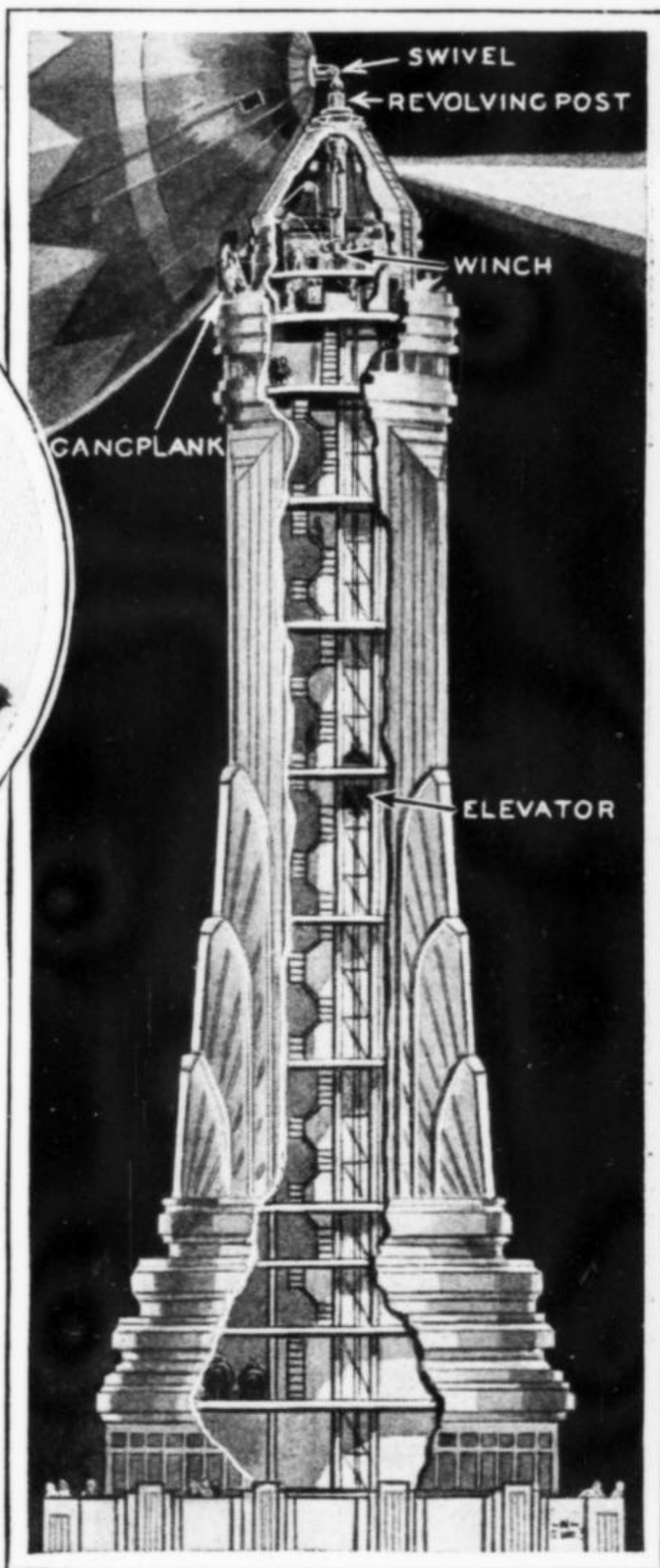
and start the car. It stops and the doors open automatically, and it not only stops for the passengers who want off, but automatically stops to pick up those who want on.

The signal system owes its being largely



A Navy blimp circling the partially completed dirigible mast atop the tall Empire State building.

to the fact that human operators could not think fast enough and make their muscles respond quick enough to catch signals and stop a car moving at 700 feet a minute. With the multi-volt gearless car and the signal system the operator has very little to do, beyond seeing that passengers get off and on safely. Instead of the old fashioned worm gear drive of the hoisting drum, the drum is built right on the armature shaft of the motor. Regardless of the type of electric current available, the hoisting motor gets its power from its own motor generator set, and therein lies its secret, for the voltage can be varied at will. When the operator in the car, or a waiting passenger at a floor, presses the signal button, a selector sets up the necessary contacts on a panel at the head of the shaft. Attached to the elevator car is a steel tape, running over a driving gear which in turn is belted to a screw moving the cross-head of the selector—virtually a small elevator. As the car travels up and down the shaft the cross head moves correspondingly, and establishes the contacts which slow down, stop and start the car. As the car approaches a stop the controller cuts out the driving current



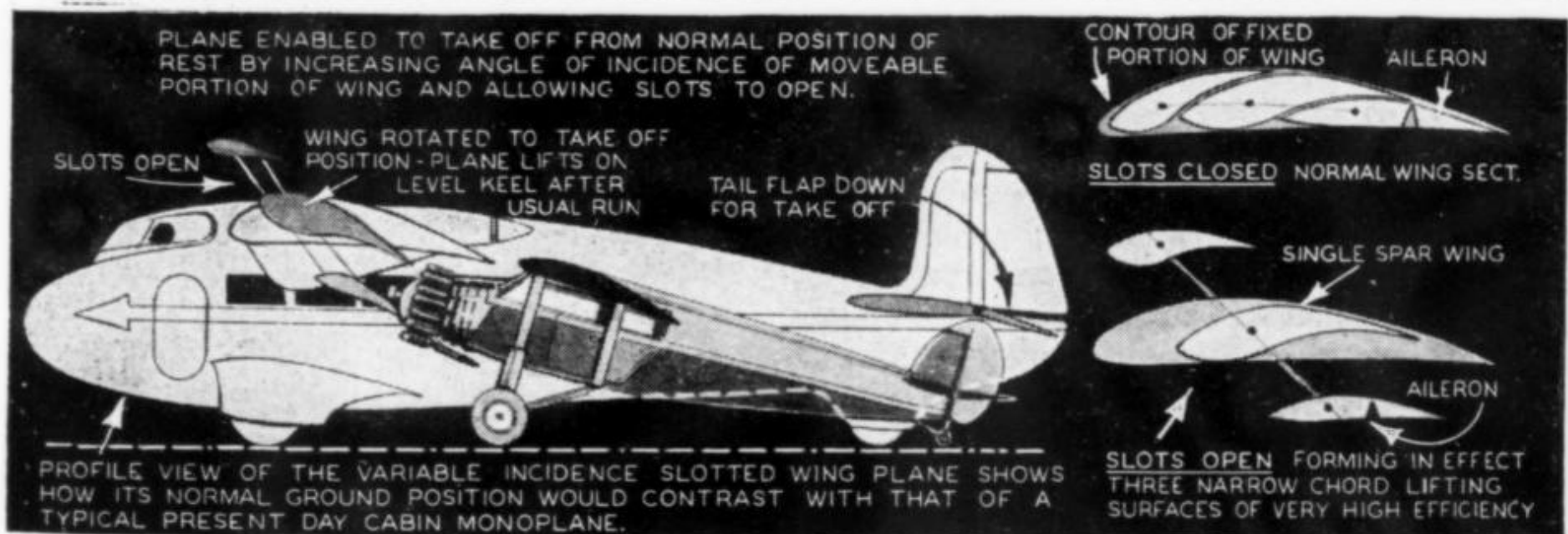
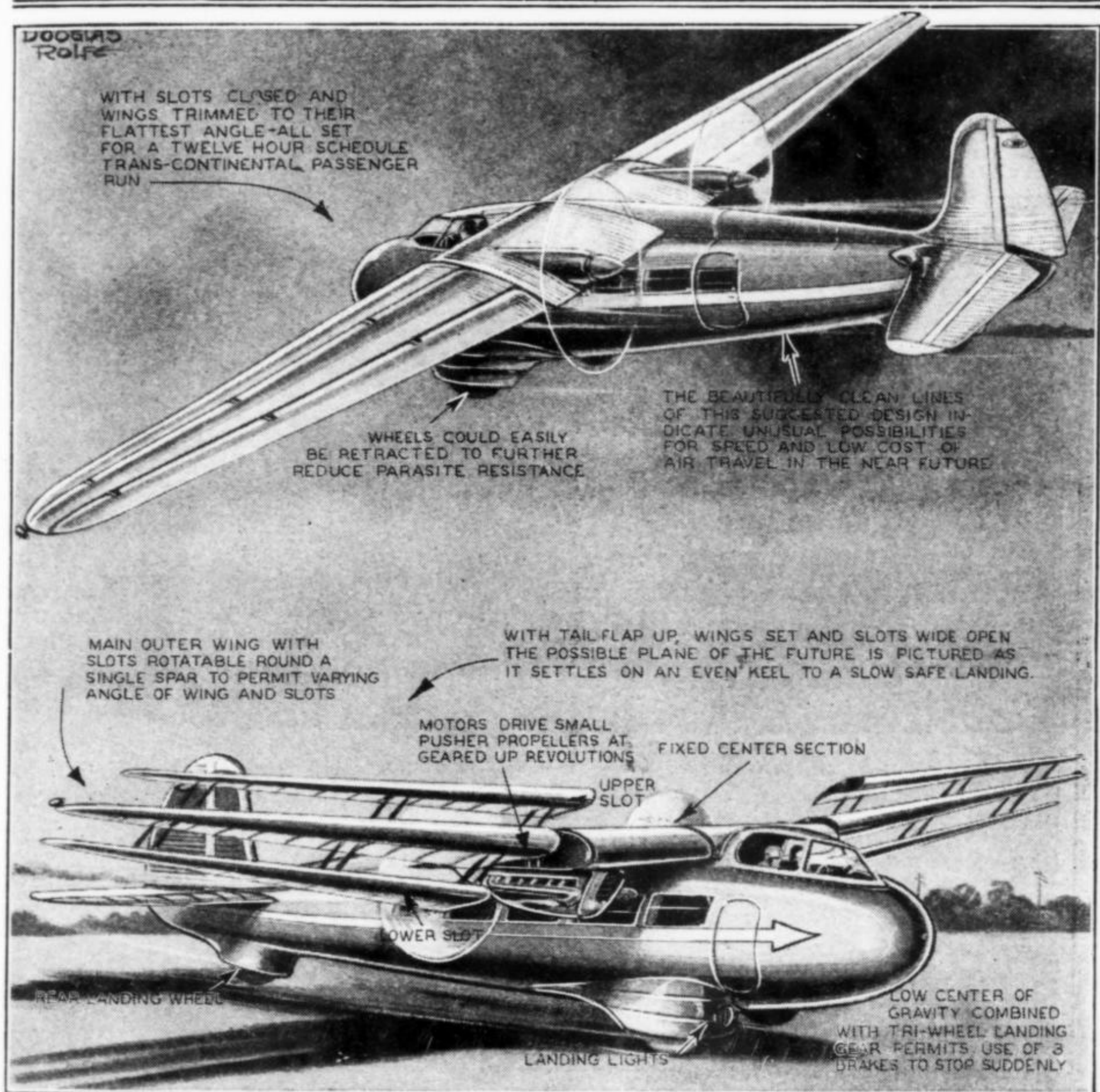
This phantom view of the Empire State mooring mast reveals structural details of the interior.

and cuts in the micro-drive, which, sending a reduced voltage through the driving motor, brings the car to a smooth stop exactly at the floor level.

Elevator counterbalances are heavier than the car, by about forty per cent of the maximum load the car may carry. As a result an empty car is lighter than the counterbalance,

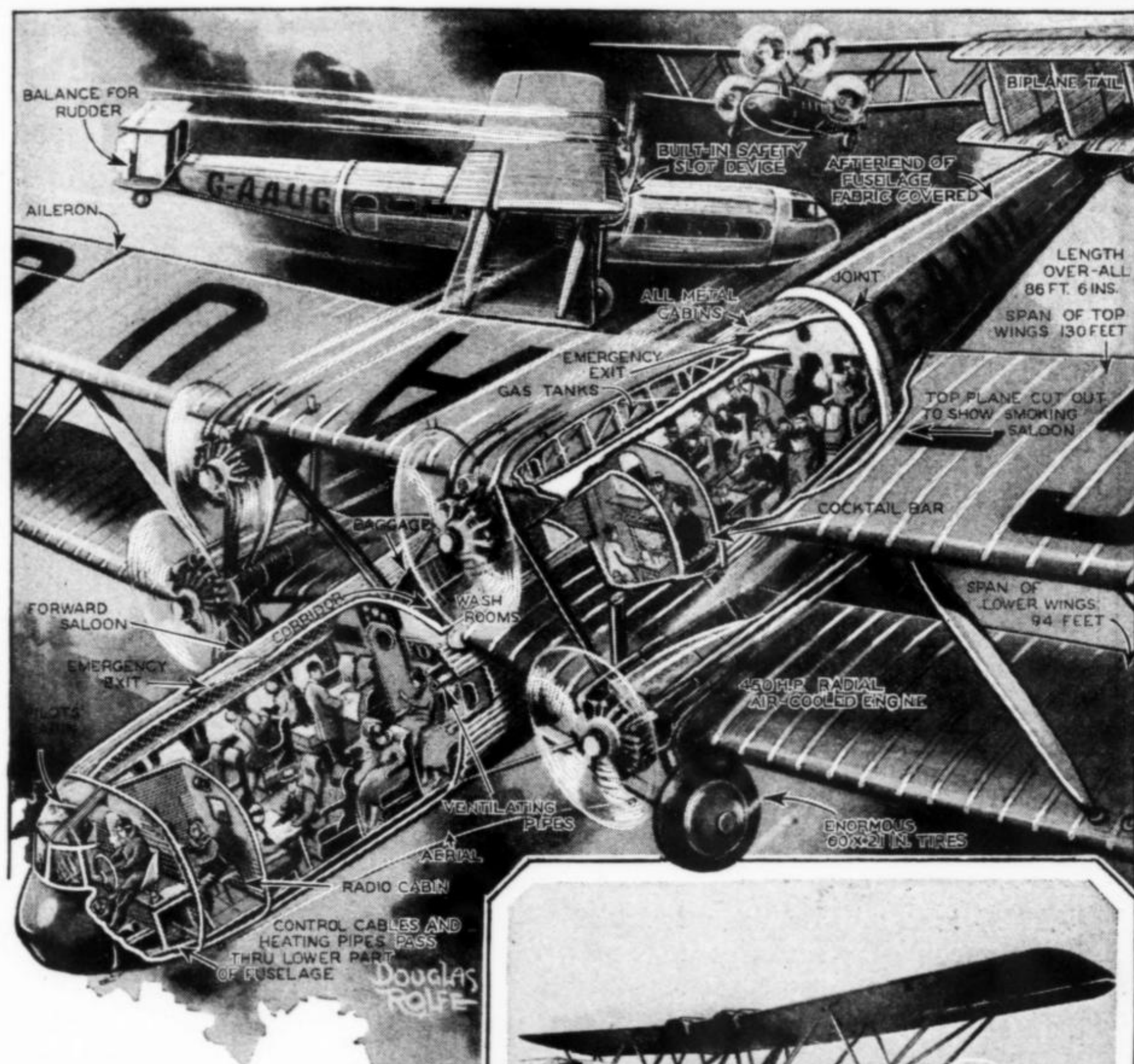
(Continued on page 204)

Single Spar Slotted Wings Next



This drawing represents a well known English aeronautical engineer's idea of what form the future passenger plane should take. The variable camber wing is not yet possible for engineering reasons.

British Build Largest Land Plane



This phantom view of the H. P. 42 shows the enormous size of the plane and gives an idea of the pains taken to cater to the comfort of the passengers. To combat noise of engines and propellers, cabins have been placed below the wings with a packing around the fuselage.

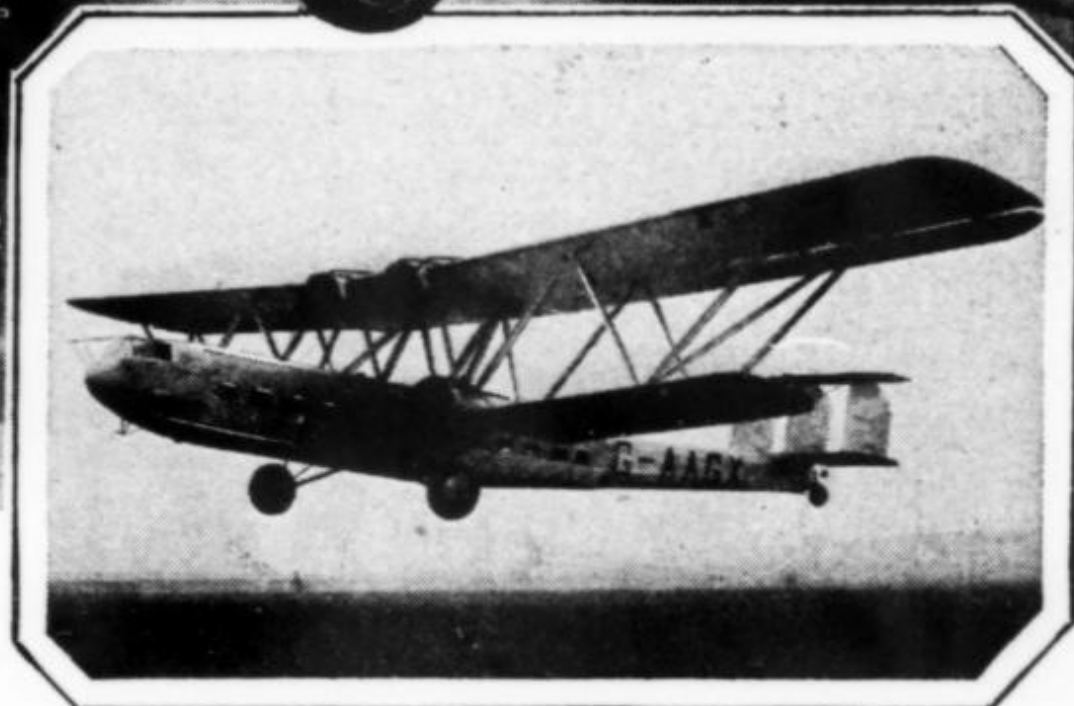


Photo shows the giant air liner taking off on its first flight.

THE Handley-Page Company of England, which is building a fleet of gigantic airliners for the Imperial Airways, recently completed the first of these mammoth ships, which made a successful trial flight.

Seven other of these planes are now under construction. Three, similar to the one shown here, are to be known as the Western type and are to be used on the continental

air routes. The other four are to be known as the Eastern type and will be used in the East and on the South African lines which supply mail and passenger service from Europe to South Africa. Externally, these two types are alike, but the Western type has a larger seating capacity, accommodating forty passengers, while the Eastern type will contain more cargo and mail space.

A FAWCETT
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NOV. 25c
IN CANADA 30c

MODERN MECHANIX AND INVENTIONS



SEE PAGE 39

HOW FRANK BUCK FILMED HIS
FAMOUS TIGER-PYTHON BATTLE

A FAWCETT PUBLICATION

This magazine and its brother publication, Mechanical Package Magazine, are not connected with or associated with any other magazine of a scientific or mechanical nature.

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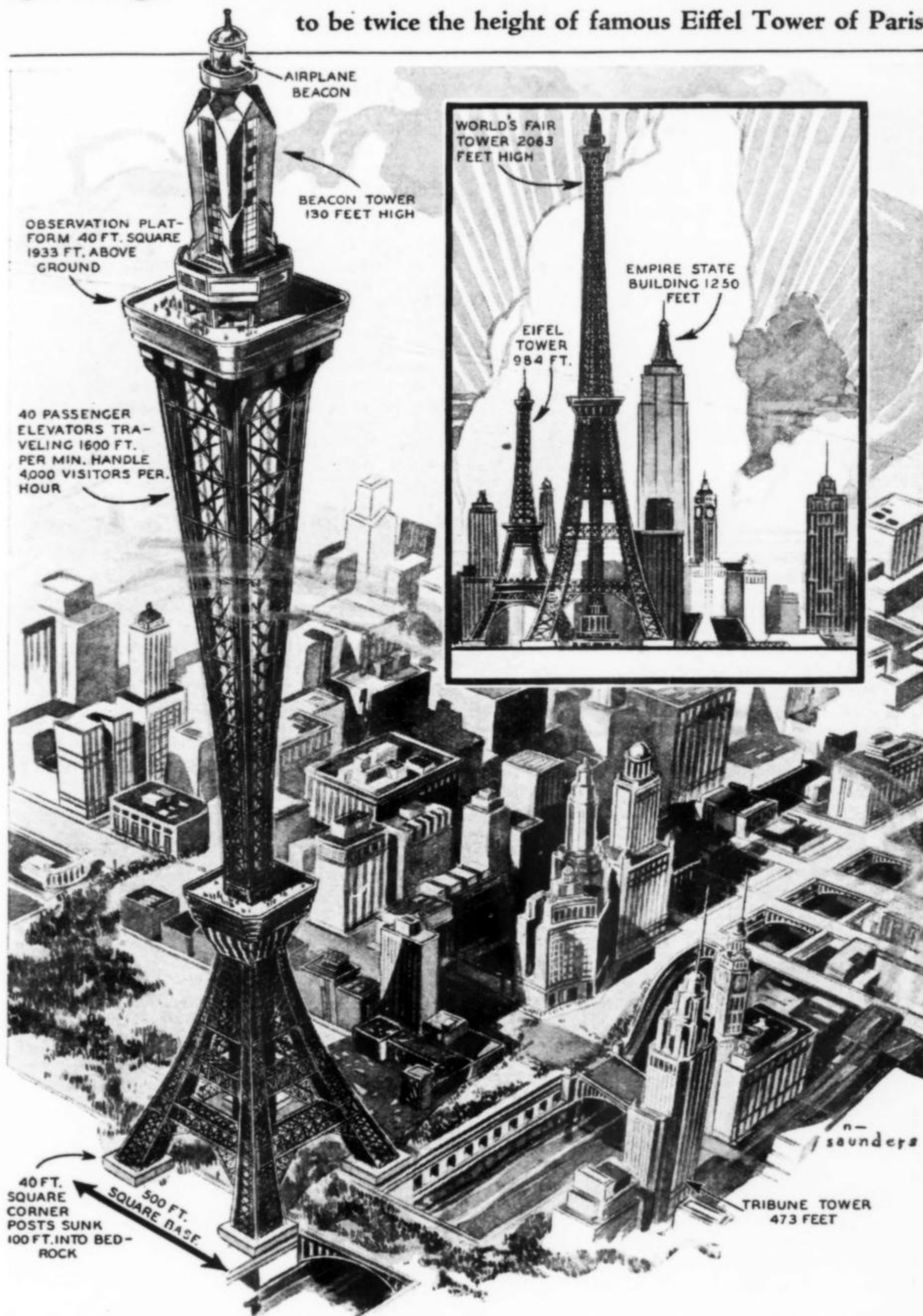
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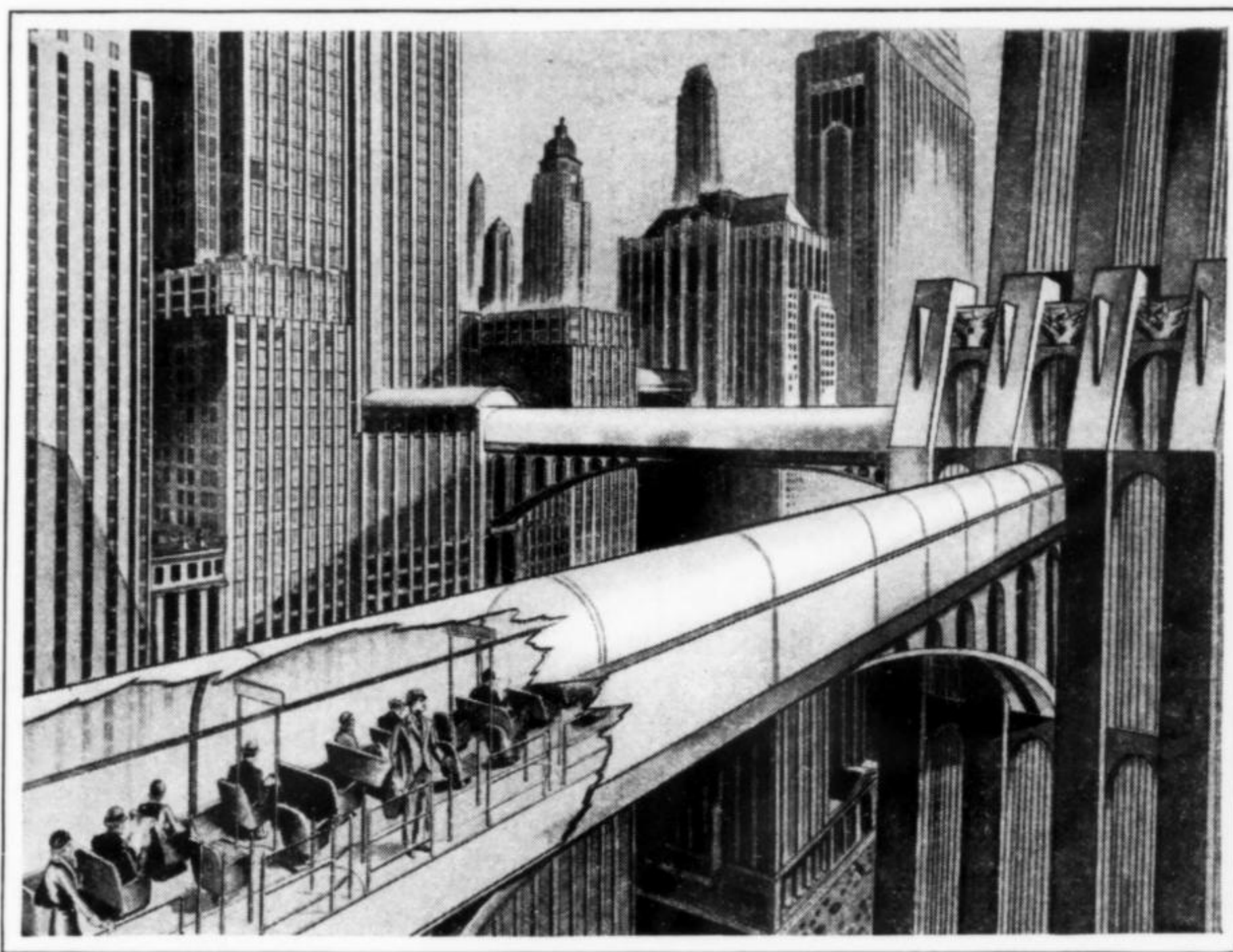
Chicago to Build World's Tallest Tower

to be twice the height of famous Eiffel Tower of Paris!



Highest structure ever built by man will be this World's Fair observation tower, planned for erection in Chicago. According to architects it will rise 2063 feet into air, 1079 feet taller than the Eiffel Tower of Paris. \$3,000,000 costs will be defrayed by admission charges. Insert shows comparison of height with other famous cloud-piercing structures.

Endless BELT TRAINS for Future Cities



Cities of the future may see the inhabitants transported on this endless belt system, which has recently been developed in Westinghouse laboratories. Passengers board slow-moving local belts, then step to faster belts, reversing process for exit.

TRANSPORTATION of city inhabitants through subway or overhead tubes on endlessly moving belts, providing more speed and comfort than our present systems of passenger service, loom as a possibility, according to Norman W. Storer, engineer of the Westinghouse Electrical Co., who has developed the idea.

As described by Mr. Storer, the system is an arrangement of continuous trains or belts of cars, running on parallel tracks. There is a stationary loading platform along the entire course of the system.

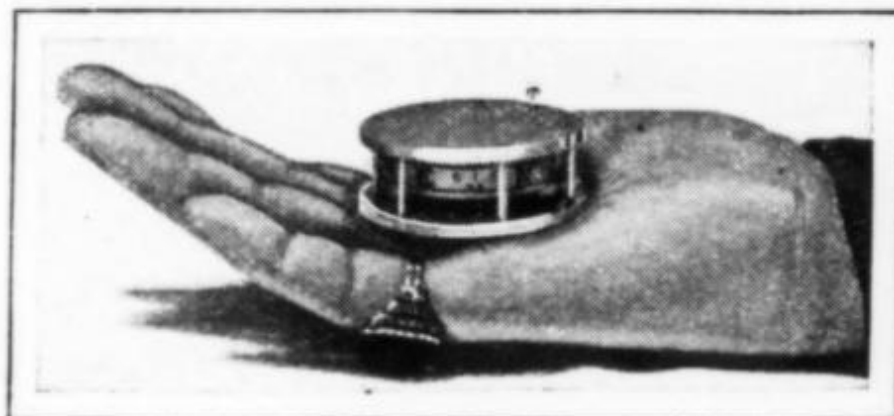
Passengers board the first local train at any point, and it stops every 50 seconds for a period of 10 seconds. When the doors close, a gong sounds and the local platform starts moving. Now there is another signal and gates open for a second platform, or express, on which the passenger takes the major part of his trip. After ten seconds the gates close and the local slows down for another stop, while the express picks up to a 22 m.p.h. speed.

Noise of the system is at a minimum, and passengers are delivered at no more than 300 feet from their streets. All stations are controlled from one central point, all elements being so timed that there can be no hitches.

Plane Type Compass for Hunters

IDEAL for hunters, hikers, Boy Scouts and even aviators whose regular instrument has failed, is a direct reading, oil pocket, airplane type of compass now on the market. So small that it can be held in the palm of the hand, as demonstrated in the above photo, the compass yet proves amazingly accurate. The pivots work in an oil pocket, providing the utmost in flexibility. One outstanding advantage is that it reads the way you are looking, which means that it points out the direction in which you stand.

It will stand the roughest usage without impairment of its accuracy.



Last word in accuracy and convenience is found in this pocket compass, so small that it can be held in palm of hand. Pivoting in oil pocket, it has minimum inertia.



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MODERN MECHANIX AND INVENTIONS



Volume XI

DECEMBER, 1933

Number 2

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GALAXY of Huge Bridges



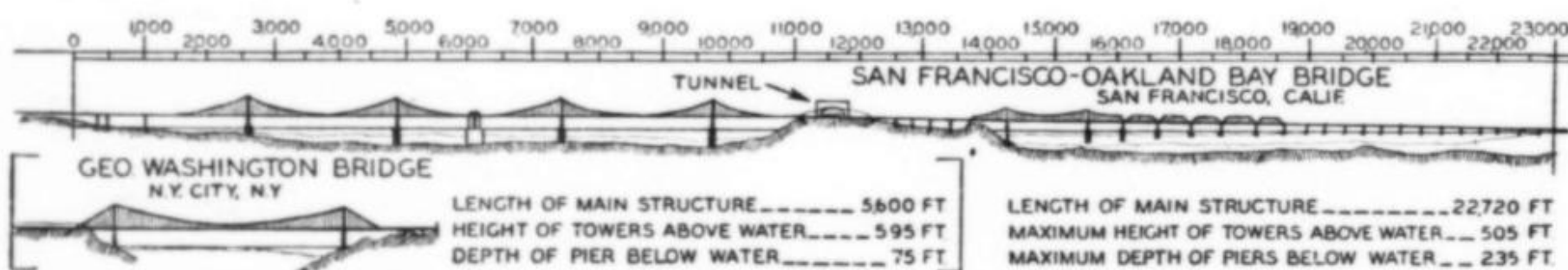
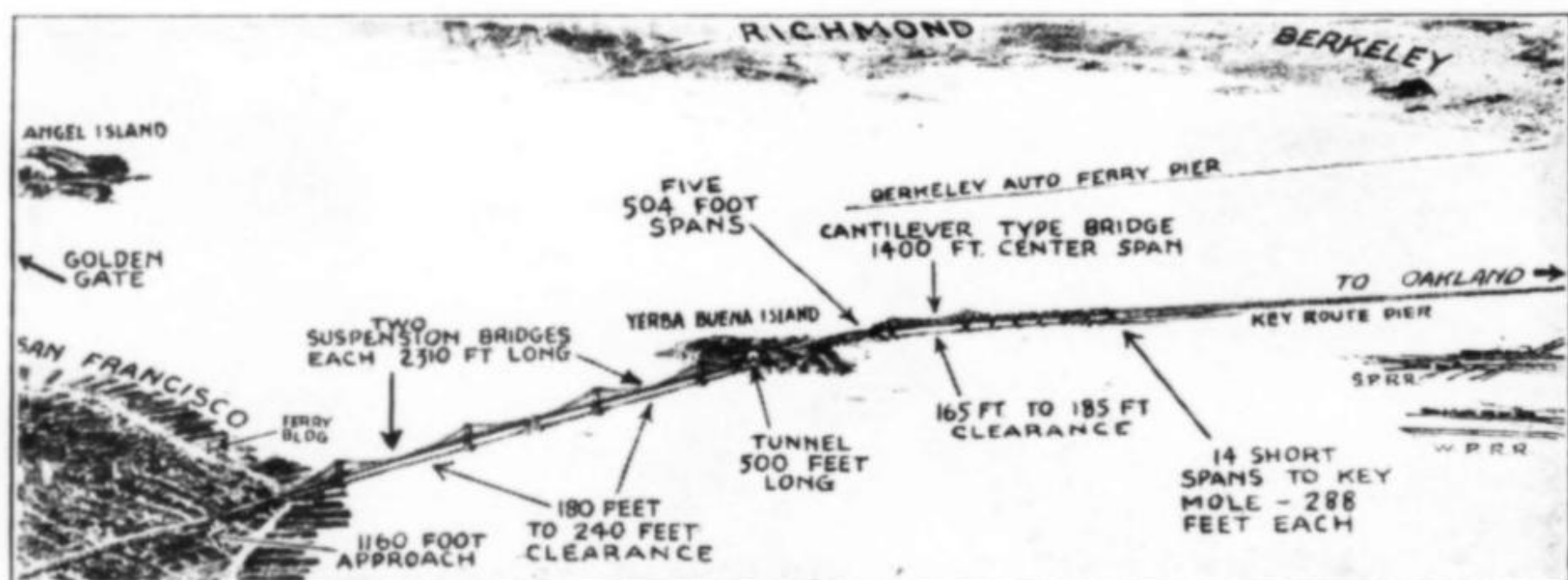
Aerial view of San Francisco-Oakland harbor, looking inland toward the Golden Gate. This shows how the Golden Gate bridge will look when finally completed, and shows the route of the huge new San Francisco-Oakland bridge, which will be called the "Bay Bridge." These will be the largest bridges in the world when completed and ready for use.

CALIFORNIA'S native sons boast of many things, such as invigorating climate, variegated scenery, soil fertility, and now they are to have another item added to their list—a bridge with the world's largest suspension span.

This will be the Golden Gate suspension

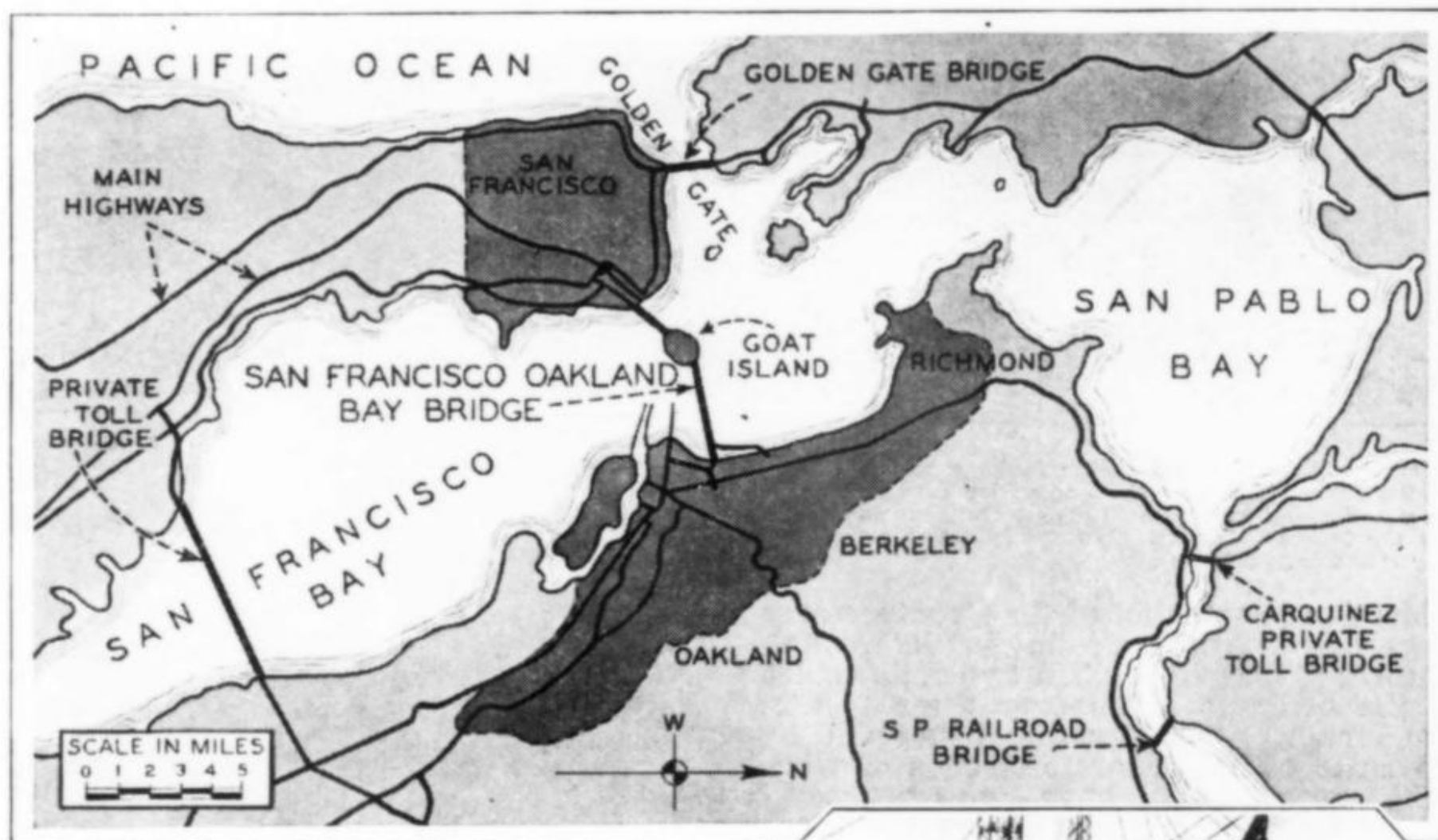
bridge, now under construction, and but part of a galaxy of huge bridges which will facilitate the movement of vehicular traffic in the western seaports.

Crossing San Francisco Bay to connect 'Frisco with Oakland, as illustrated in the drawing above, another bridge will form an



Costing more than \$108,000,000 the Oakland-San Francisco bridge will be flung across the Bay along the route illustrated in artist's drawing above. Its eight and a half mile length eliminates car ferry crossings and 30-mile trek by land. In drawing below graphically presented are outstanding features of the structure. Tallest liners may pass beneath the bridge.

for San Francisco-Oakland



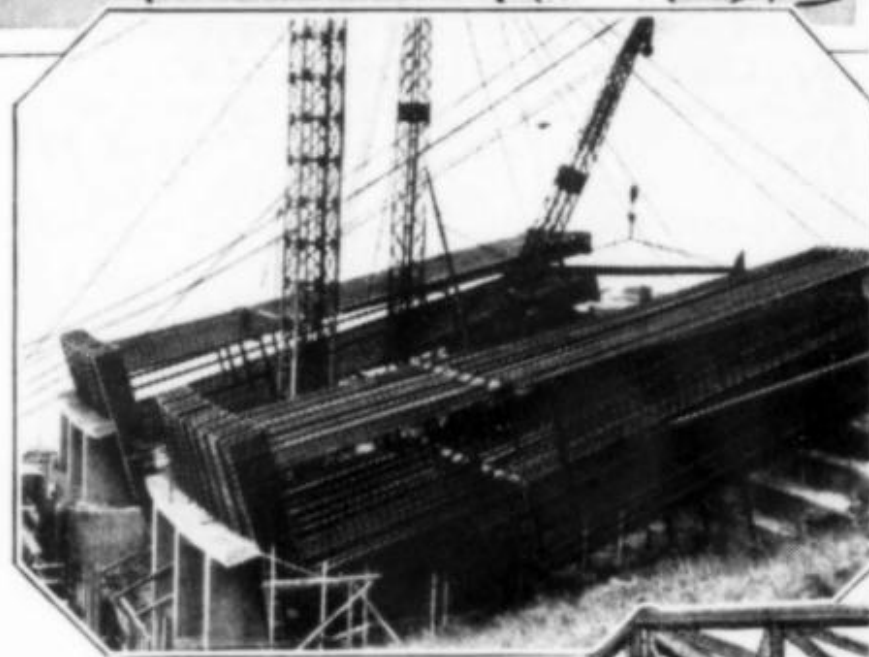
The San Francisco-Oakland Bay galaxy of bridges is shown in this map. The Golden Gate bridge, huge suspension type, will span the opening of the harbor. The existing private toll bridge is also shown, and also the route of the new 8-mile Bay bridge, across Goat Island.

automobile and train straightaway down the Pacific Coast—the San Francisco-Oakland “Bay Bridge.”

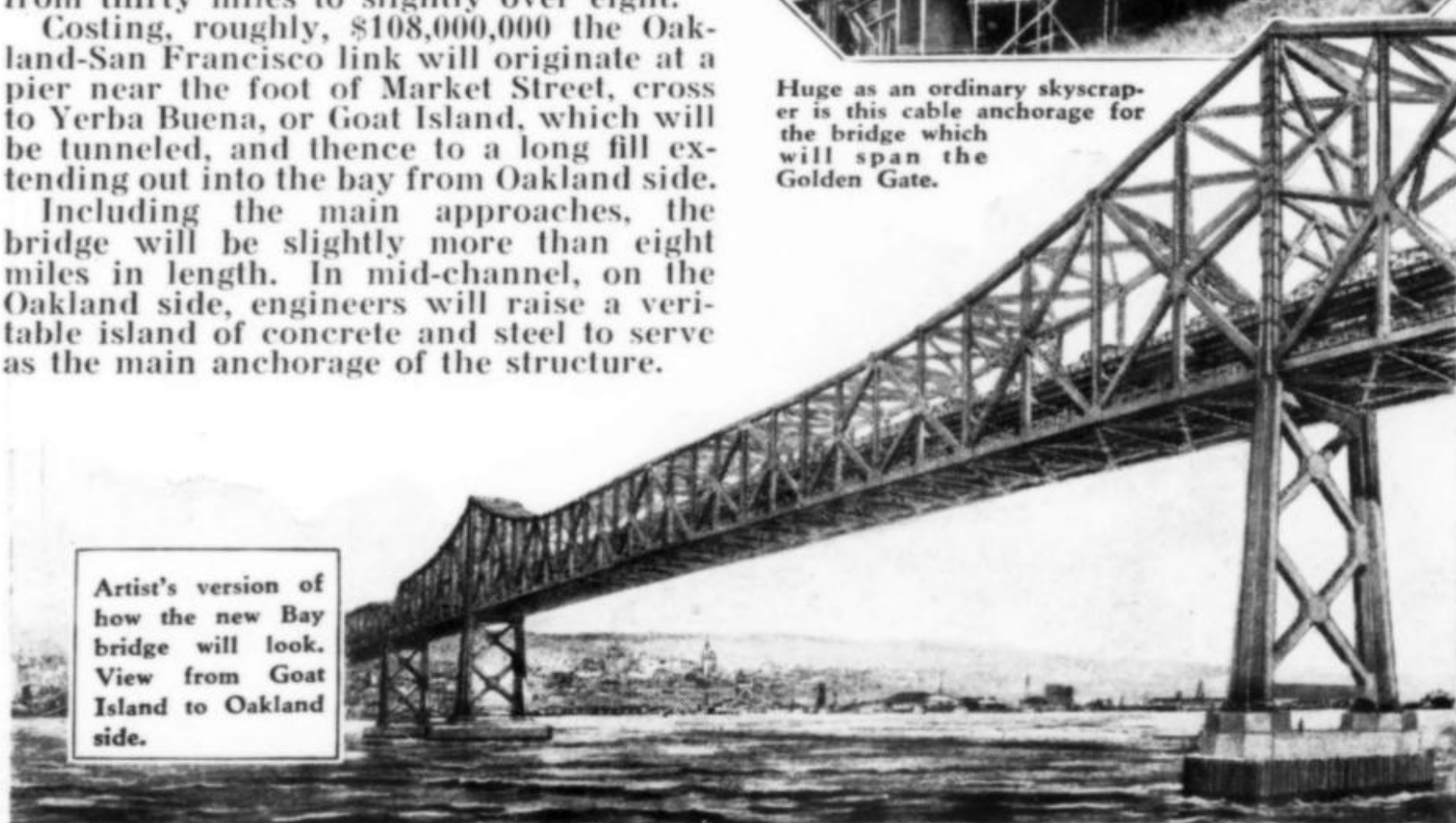
Heretofore autos and trains have been compelled to cross the bay by ferry, or take a circuitous 30 mile trek skirting the water's edge. The bridge cuts the journey from thirty miles to slightly over eight.

Costing, roughly, \$108,000,000 the Oakland-San Francisco link will originate at a pier near the foot of Market Street, cross to Yerba Buena, or Goat Island, which will be tunneled, and thence to a long fill extending out into the bay from Oakland side.

Including the main approaches, the bridge will be slightly more than eight miles in length. In mid-channel, on the Oakland side, engineers will raise a veritable island of concrete and steel to serve as the main anchorage of the structure.



Huge as an ordinary skyscraper is this cable anchorage for the bridge which will span the Golden Gate.



Artist's version of how the new Bay bridge will look. View from Goat Island to Oakland side.

Walking Bridges to Carry Caissons Is Latest Construction Suggestion



Enormous in its size and daring in its execution is this Golden Gate bridge, now building at San Francisco. This is a view looking west through the Golden Gate and shows how the bridge will look. So huge is it that mere wind sway allowance has been set at 13 feet!

Massive proportion of the structure may be perceived from the following interesting features of the bridge: The two main cables of the bridge will be over three feet in diameter, 7,660 feet long, and they will be woven of 27,572 separate strands of wire.

The largest of the huge cantilever spans penetrates 256 feet below the surface of the water, the equivalent in height of a 23-story building, and towers 300 feet above water.

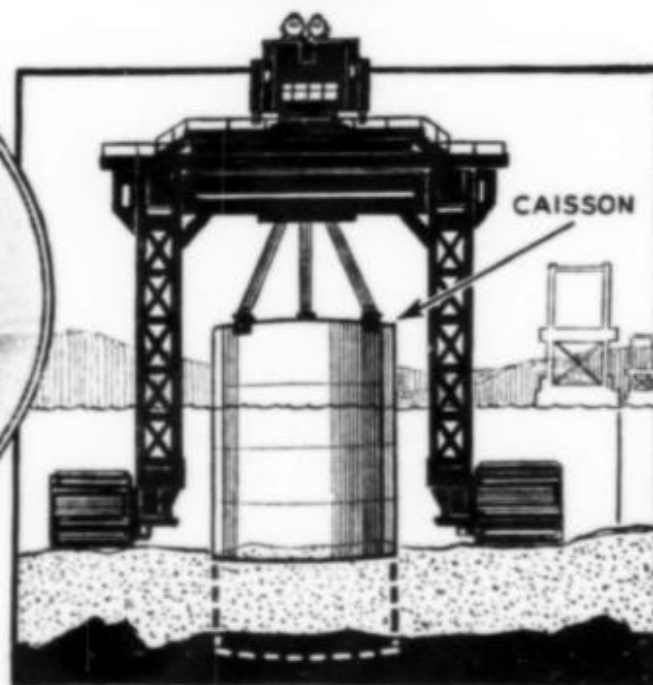
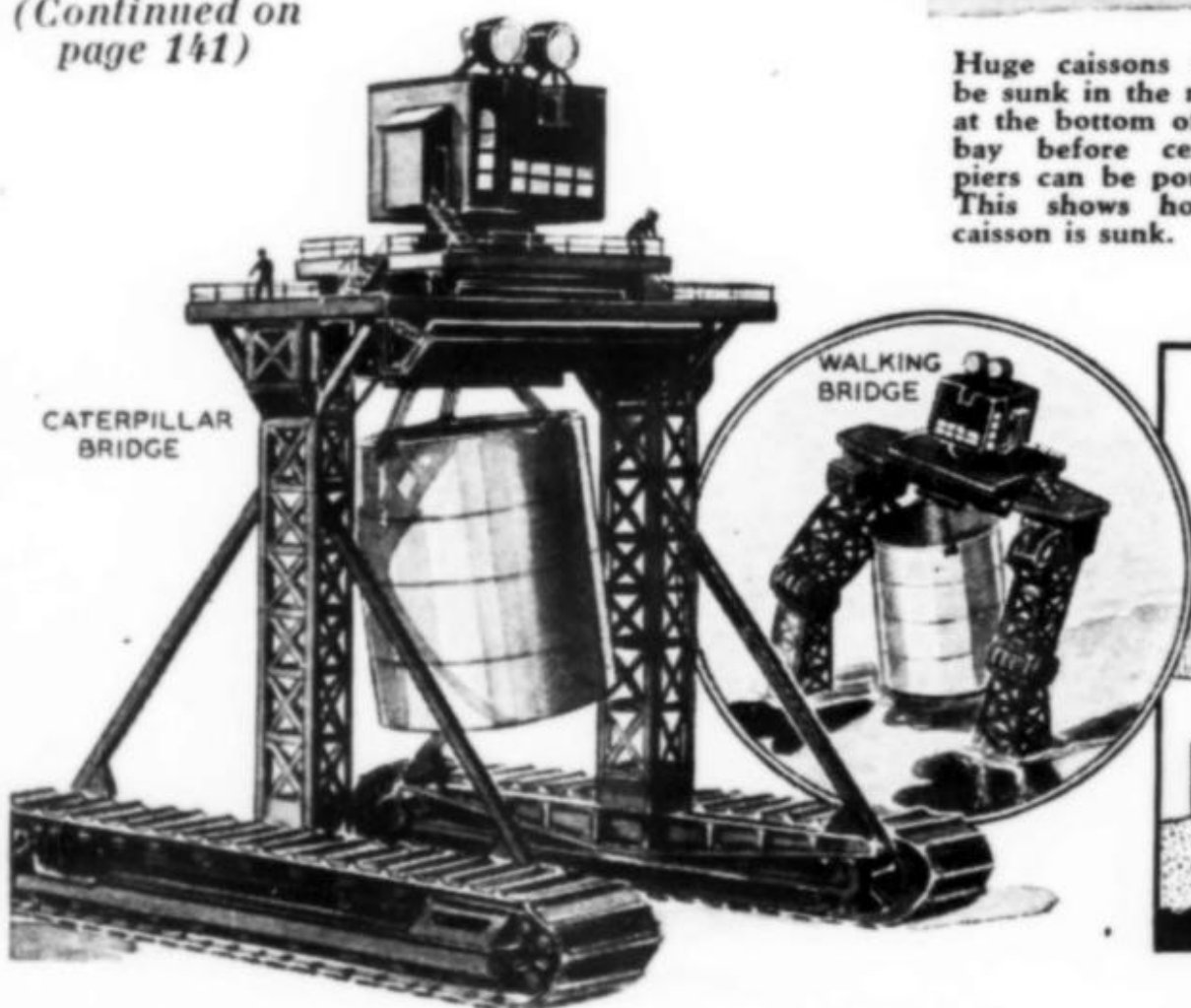
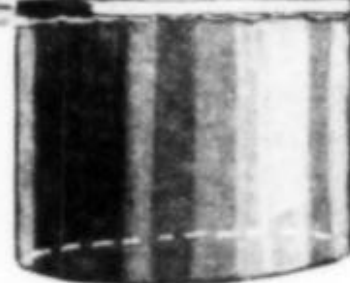
To resist wind and earth forces the bridge is being built to allow a sway of 13 feet, and yet sustain a peak load capacity of 430,000,000 pounds.

New Yorkers who view the George Washington Bridge with awe are given something really huge to talk about when it is

(Continued on page 141)

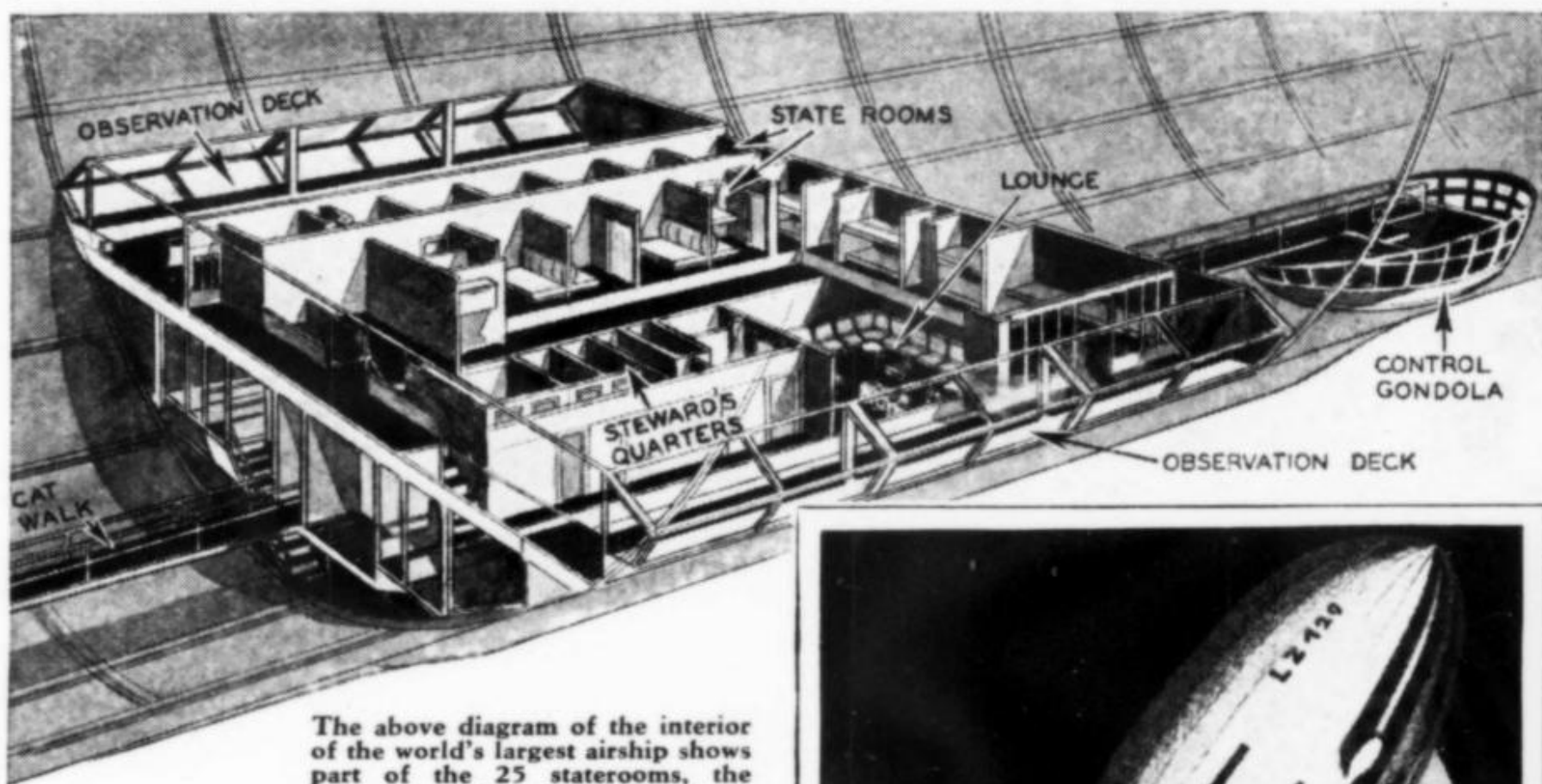


Huge caissons must be sunk in the muck at the bottom of the bay before cement piers can be poured. This shows how a caisson is sunk.



One engineer's suggestion for the solution of the problem of sinking caissons is depicted here in this picture of a "walking bridge." Definite placement of caissons has always been an engineering bugaboo when they are floated over a spot and sunk. Especially is this true in harbors where there are tide rips, or in rivers where strong currents are found. While the walking version may be impracticable, a caterpillar footed bridge is certainly plausible and has many merits from a constructional standpoint.

Super Zep is 175 Feet Longer Than Akron



The above diagram of the interior of the world's largest airship shows part of the 25 staterooms, the lounge and the observation deck.

GERMANY'S new super zeppelin, the L. Z. 129, will be the largest airship in the world, outranking the present "Queen of the Air," the U. S. Navy's Akron, by 175 ft.

The giant airship, nearing completion at Friedrichshafen, will be approximately 812 feet long and will join the present "Graf Zeppelin" in trans-Atlantic commercial voyages. The L. Z. 129 will have 25 comfortable staterooms with hot and cold running water, a dining room seating 38 persons, and an observation deck with glass panels through which the passengers can view the earth below.

An unusual feature of the new zeppelin is the construction of the gondola and passenger quarters directly within the framework of the ship, eliminating the usual control car attached to the framework. Kitchen and lounge also are included in equipment.



Germany's new super zeppelin, the L. Z. 129, shown in the above drawing, will be 812 feet long. It will be used in trans-Atlantic commerce. The dining room will seat 38 persons and staterooms will have hot and cold water.



Photo shows start of test run with alcohol-gasoline fuel recommended as a means of reducing the farm surplus.

Urge Alcohol Gas for Farm Relief

FOR economic and technical reasons a mixture of alcohol and gasoline for automobile fuel is being recommended by farm relief advocates.

Use of the fuel by motorists would consume 680,000,000 bushels of corn a year, greatly reducing the crop surplus, it is said. The gasoline would be diluted with 10 per cent of alcohol. It is claimed the fuel results in greater power at considerably less cost.

Midwestern farmers, seeking adoption of the fuel, claim that it has a higher anti-knock value, will start the motor more readily, give a faster pickup, form less carbon, will not increase oil dilution, and results in a cooler engine than ordinary gasoline.

The fuel, they say, uses a greater volume of air and burns more evenly in the cylinders.

Aug.
25¢

MODERN MECHANICS

AND INVENTIONS

LP



STEWART
ROUSE

A GRAVITY RAIL WAY WILL IT WORK?
SEE PAGE 12

Other Fawcett magazines are Screen Play Secrets, Triple-X, Battle Stories, Startling Detective Adventures and True Confessions.

MODERN MECHANICS AND INVENTIONS

AUGUST, 1930

PRICE 25 CENTS

This magazine is not connected with or associated with any other magazine of a scientific or mechanical nature.

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COMING IN SEPTEMBER

A fascinating "behind the scenes" story of how movie scenes are faked, written by Hollywood's foremost designer of miniature movie sets, leads off the September Modern Mechanics, on sale August first. Also the first installment of plans for the Georgia Special High-Wing Monoplane, and a score of other timely features and how-to-build articles which make this issue one of the best yet. Reserve your copy now.

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Former Assistant Chief,
U. S. Air Service

Pilot Gene Shank
Famous Aviator, Holder of
Light Plane Endurance
Flight Record

Weston Farmer
Naval Architect and Light
Plane Designer

Ivan Driggs
Noted Light Airplane
Designer

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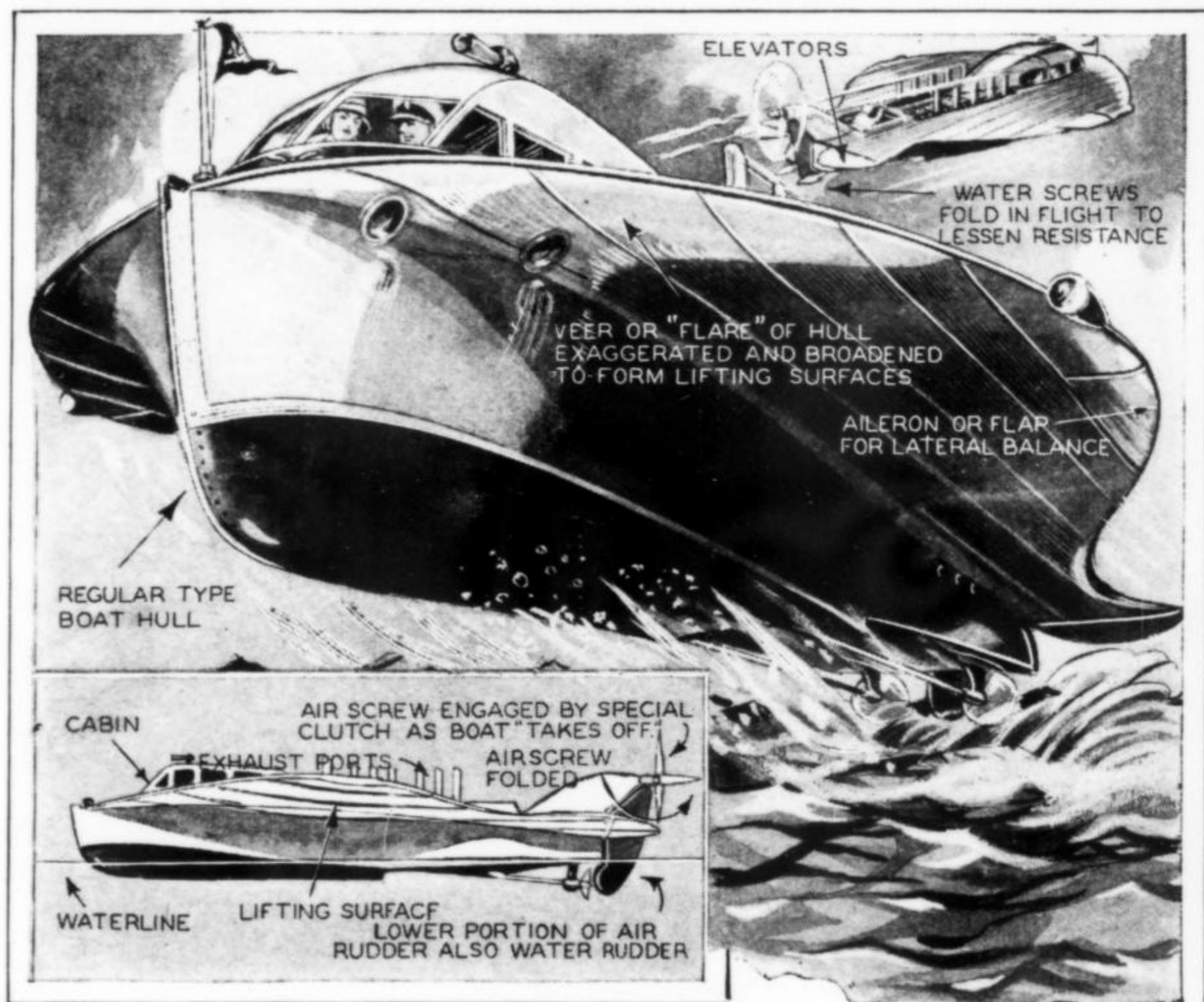
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Gar Wood Predicts Boats that Fly



Suggested lines of a speedboat which can fly as well as float are shown in this drawing of a double-purpose craft seen as a possibility of the future by Gar Wood, famous designer of racing boats.

MODERN speedboats show very little difference between the way they travel through the water and the way an airplane travels through the air. This is the observation of Gar Wood, noted designer of record-breaking speedboats, who recently remarked that he would not be greatly surprised to learn one of these days that boats are flying. A big thrill is in store for sportsmen when the time comes when one can own a boat and drive it about on the surface of the water, and then throw the engine into high, work the clutch on a propeller designed to get the craft into the air, and fly.

A speedboat, due to the step under the hull, is traveling almost in the air, or at least in a medium of spray and water that is largely bubbles. The veer or flare of a speedboat hull is in a measure a wing-

like structure, helping to elevate the boat out of the water at high speeds. If the flare were exaggerated and broadened, as illustrated in the drawing above, it would be possible to lift the boat out of the water and maintain sustained flight in the air—provided, of course, that it was equipped with a propeller of sufficient size to provide forward movement.

What is now known as a "flying boat" is in reality an airplane that can float, not a boat that can fly. A real flying boat such as the one shown would be equipped with a water screw of special design so that it would fold up out of the way when the boat was flying, with a similar folding arrangement for the air propeller so that it would be out of the way when the boat was traveling on the water.

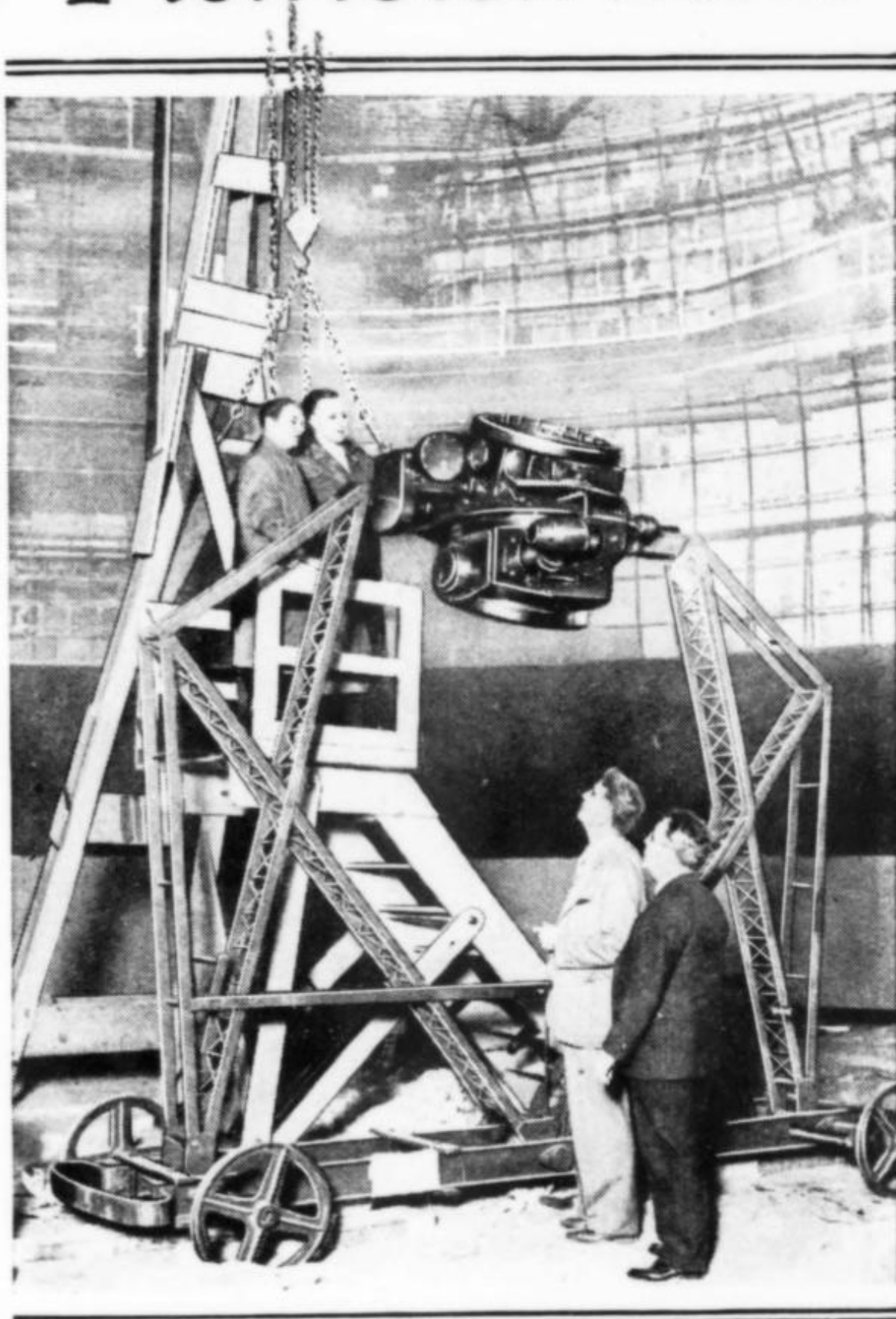
Chicago's Planetarium

The building, of rainbow granite from St. Cloud, Minn., is surmounted by a copper dome 82 feet in diameter. Within, and suspended from the outer dome, is an inner one 68 feet across, supporting the linen sky. Around the central dome are grouped exhibition halls for the ancient instruments, cloak rooms and offices.

The planetarium projector has 119 lenses, through which the star images are projected from lantern slides. Dr. Philip Fox, who resigned his position of professor of astronomy at Northwestern University to become the director of the planetarium, has arranged with the Zeiss company to build additional attachments which will enable the machine to show special slides of new comets and other astronomical happenings as they are reported from time to time in the newspapers.

The balls at the end of the dumb-bell-like projector house the lights and lenses for the fixed stars in each of the hemispheres. The central mechanism takes care of the sun, moon and the planets, while the rotation of the instrument provides for the apparent movement of the stars as the earth rotates, and also makes it possible to speed up that movement to any desired pace. For example, the movement of the north pole star through its orbit, a process that takes 26,000 years, can be shown in one minute, by cutting out the planetary motors. If the planetary motion is kept in gear it would take about 36 hours to show the 26,000 year cycle.

The machine also can be set to show the heavens at any given date in the past or future. For example, it can be made to reproduce the stars as Columbus saw them, or going farther back, can show the heavens that the Roman astrologer read the night

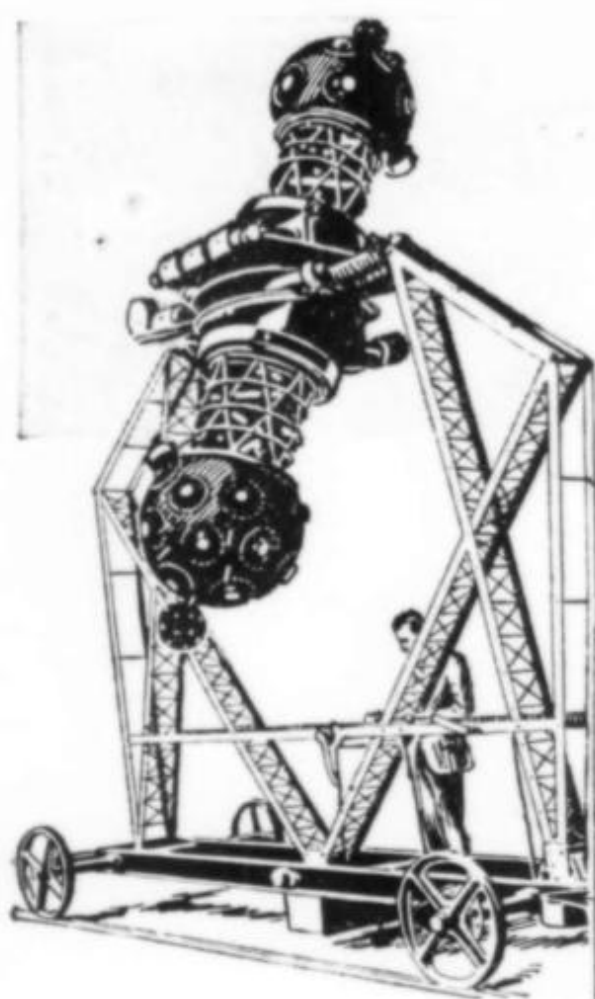


The frame and central section of the projector being installed inside the partly completed planetarium building. The steel framework visible in the background will be covered with linen to form a sky canopy on which stars, planets, nebulae, and other astronomical phenomena can be projected electrically.

before Caesar was murdered. Or again, the conjunction of the planets that produced the bright star over Bethlehem the night the Christ child was born can be shown at will.

Inside the planetarium building the wall has been painted with the skyline of a city in which tops of buildings give a natural appearance to the horizon. Seats are provided around the projector for the spectators. The lecturer stands on a platform and controls the movements of the projector from an elaborate switchboard placed in front of him. To call attention to particular

Complicated Arrangement of Lights and Slides Shows Planet Movements



The projector set to reproduce the sky as it appears from the north pole. The projector can be set to reproduce the sky for the spectators as it appears from any point on earth.

stars he uses a flashlight beam as a pointer. Through speeding up the projector and showing planets and satellites traveling across the sky in their appointed orbits, the machine is able to present in a graphic, visible way a picture which months of study of diagrams and descriptions could not equal.

Mechanical construction of the Zeiss projector is marvelously intricate, as may be gathered from the fact that it cost \$90,000 and required the services of 100 skilled workmen for nine months in its building. An example of the complicated construction can be seen in the drawing of the mechanism for projecting the planets, as reproduced on this page. Lights representing Venus, Mercury, Jupiter, and sister planets move about on a series of eccentric disks so that they are projected in their true orbits. A single shaft driven by a motor operates the whole planet mechanism.

Since the projector rotates on its axis, electric wire connections are made through circular contact points which permit free rotation.

A much appreciated advantage of the planetarium is that it permits one to study sections of the sky he has never seen. For instance, a dweller in the northern hemisphere may never see the Southern Cross, but the planetarium will show him this feature of the southern skies. Likewise, when a new planet swims into the sea of astronomical knowledge, as occurred only recently, special slides showing its position in relation to other stars, its

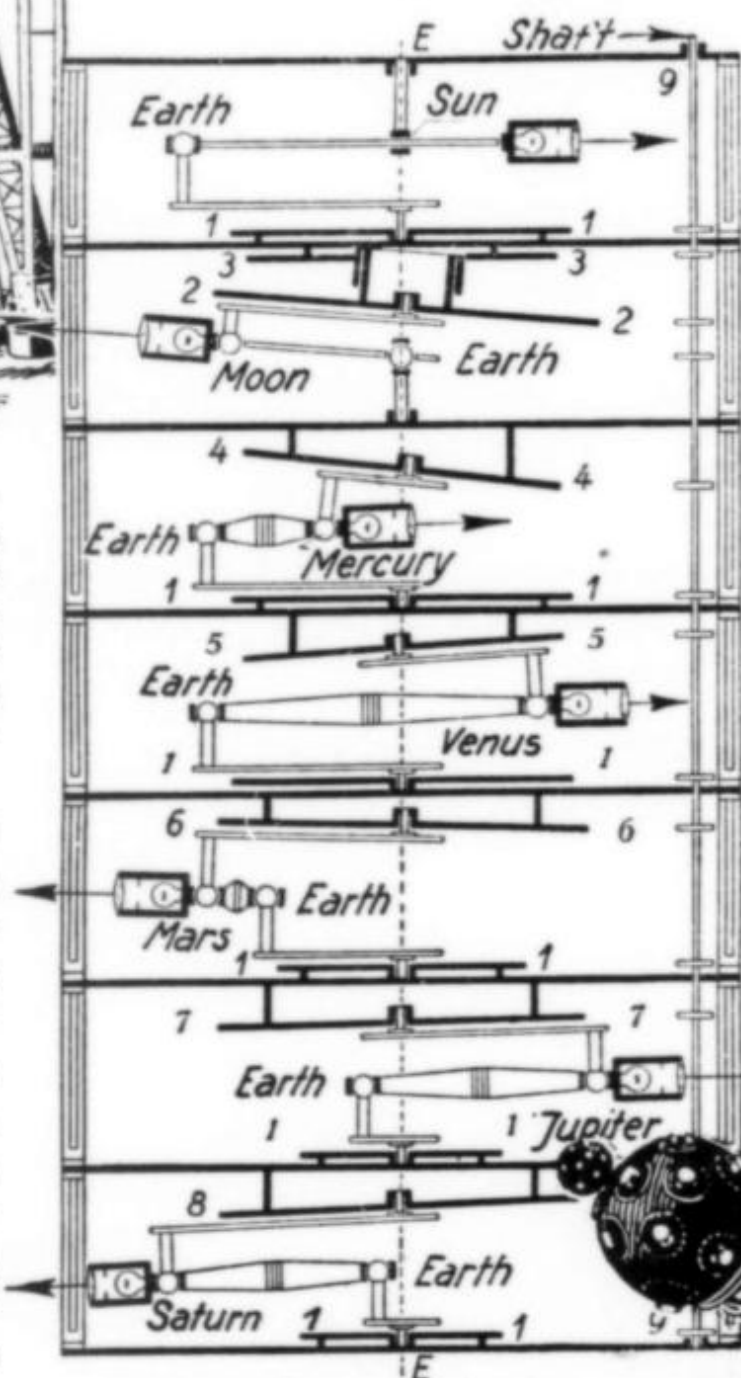
relative brightness, and its probable orbit, help the layman to understand significance of the discovery.

The photo on page 99 shows a side elevation of the Zeiss planetarium from the north with the machine set to show the aspect of the heavens from the North Pole of the earth. Its parts are disposed as follows:

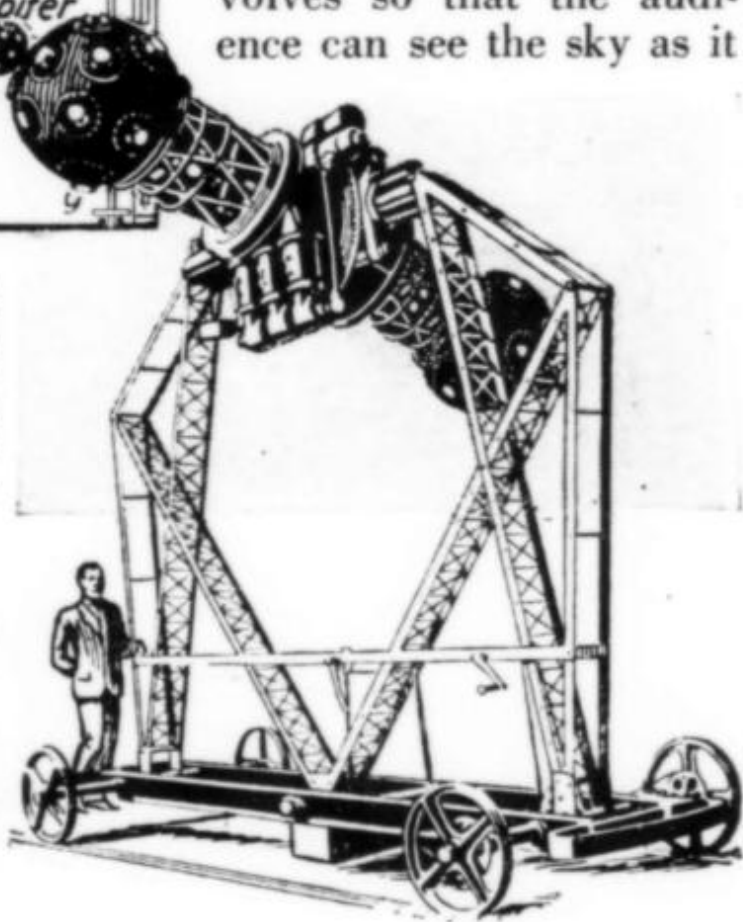
1-1—Polar axis, perpendicular to the terrestrial equator.

2-2—Axis of the ecliptic, perpendicular to the plane of the earth's orbit.

3-3—Axis for varying the geographical latitude, around which all the projection apparatus revolves so that the audience can see the sky as it



Apparatus for reproducing movements of planets and the earth's moon. The shaft at the right operates all the disks which control the movements of lights representing the planets.



Here the projector is set to reproduce the sky as seen from equator.

Six Thousand Stars Are Shown by This Marvelously Intricate Projector

appears from any point on the earth's surface.

4-4—Thirty-two projectors, distributed over the two star carriers, one for the northern sky and one for the southern, for the representation of 5,400 fixed stars.

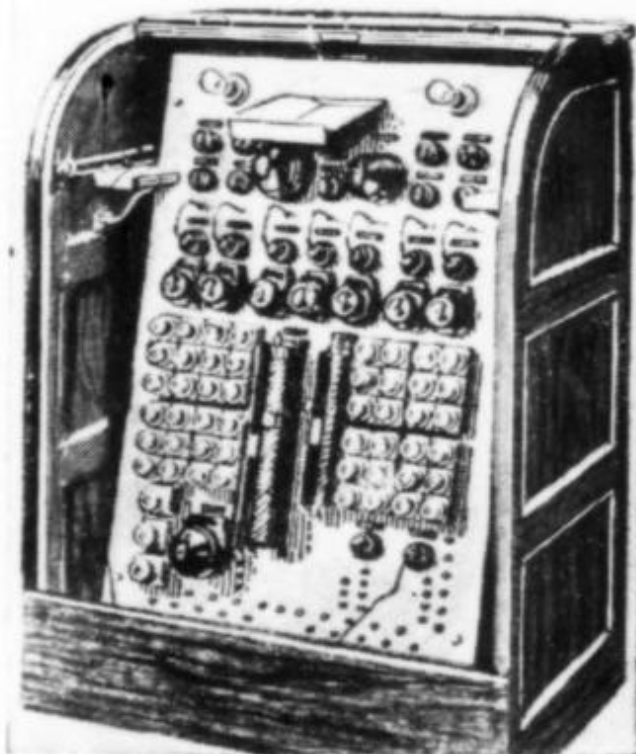
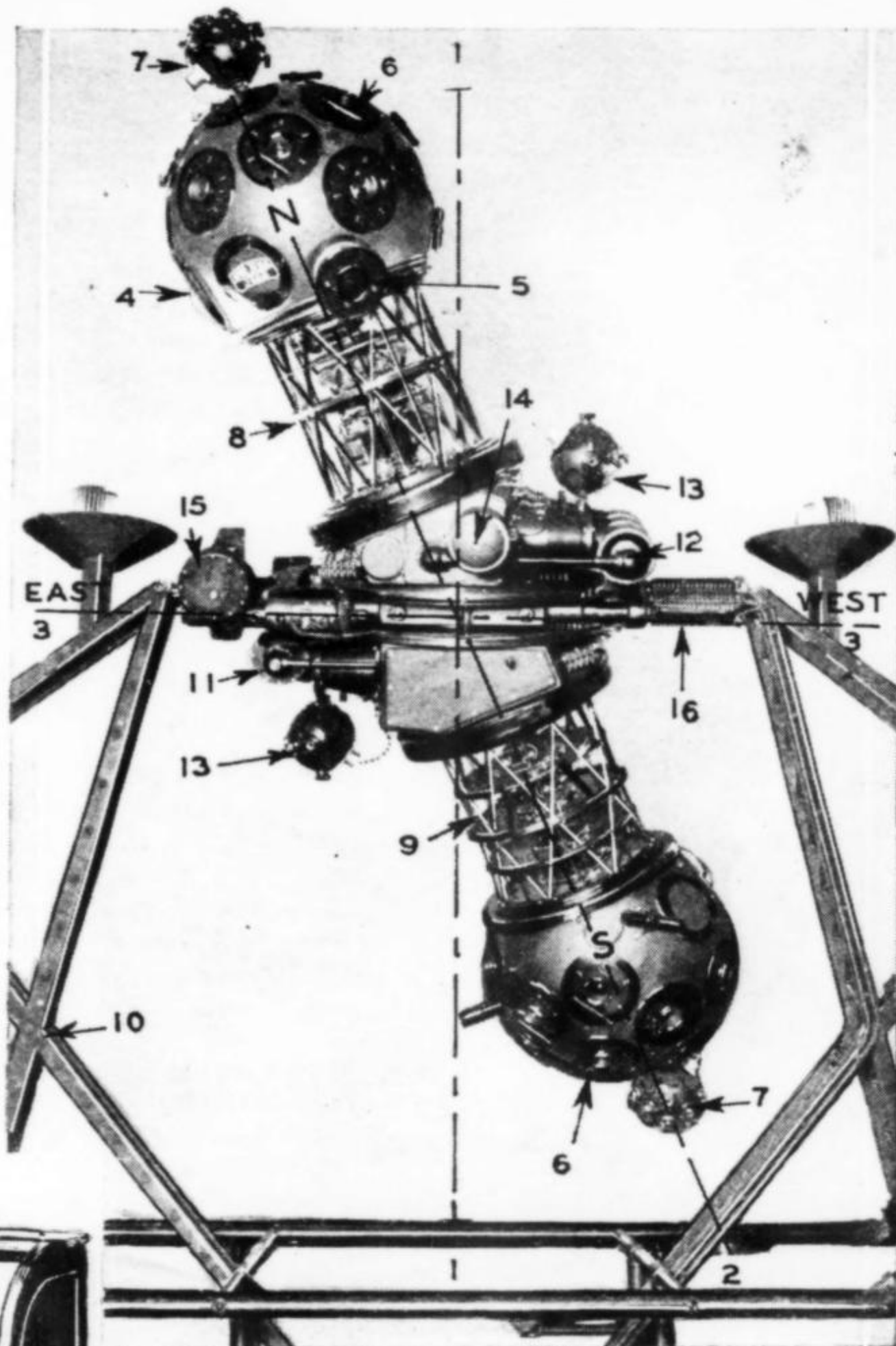
5—Projector for the Milky Way; similar projector is not visible on the southern hemisphere.

6-6—Eighteen projectors for nebulae, star clusters, and the brightest star, Sirius, the dog star.

7-7—Thirty-two projectors for constellation names and the circle described by the pole in consequence of the gyroscopic motion of the earth.

8—Ten projectors and the mechanisms for the sun, its halo, the Moon, Saturn, and the Zodiacal Light.

9—Eight projectors and the mechanisms for Mercury, Venus, Mars and Jupiter.



Switchboard used by the planetarium lecturer. The keys enable him to control the projector. Note the great number of switches.

10—Frame.

11—Two motors for the diurnal motion, a day in 1, 2, 3 or 4 minutes.

12—Three motors for the annual motion, a year in 7.3 seconds or 1, 3, 4 or 7 minutes.

13-13—Twelve projectors for the central lines of the Zodiac (ecliptic) and the celestial equator, the north and south polar points.

14—One motor for the gyroscopic motion of the earth, 26,000 years in 4 minutes.

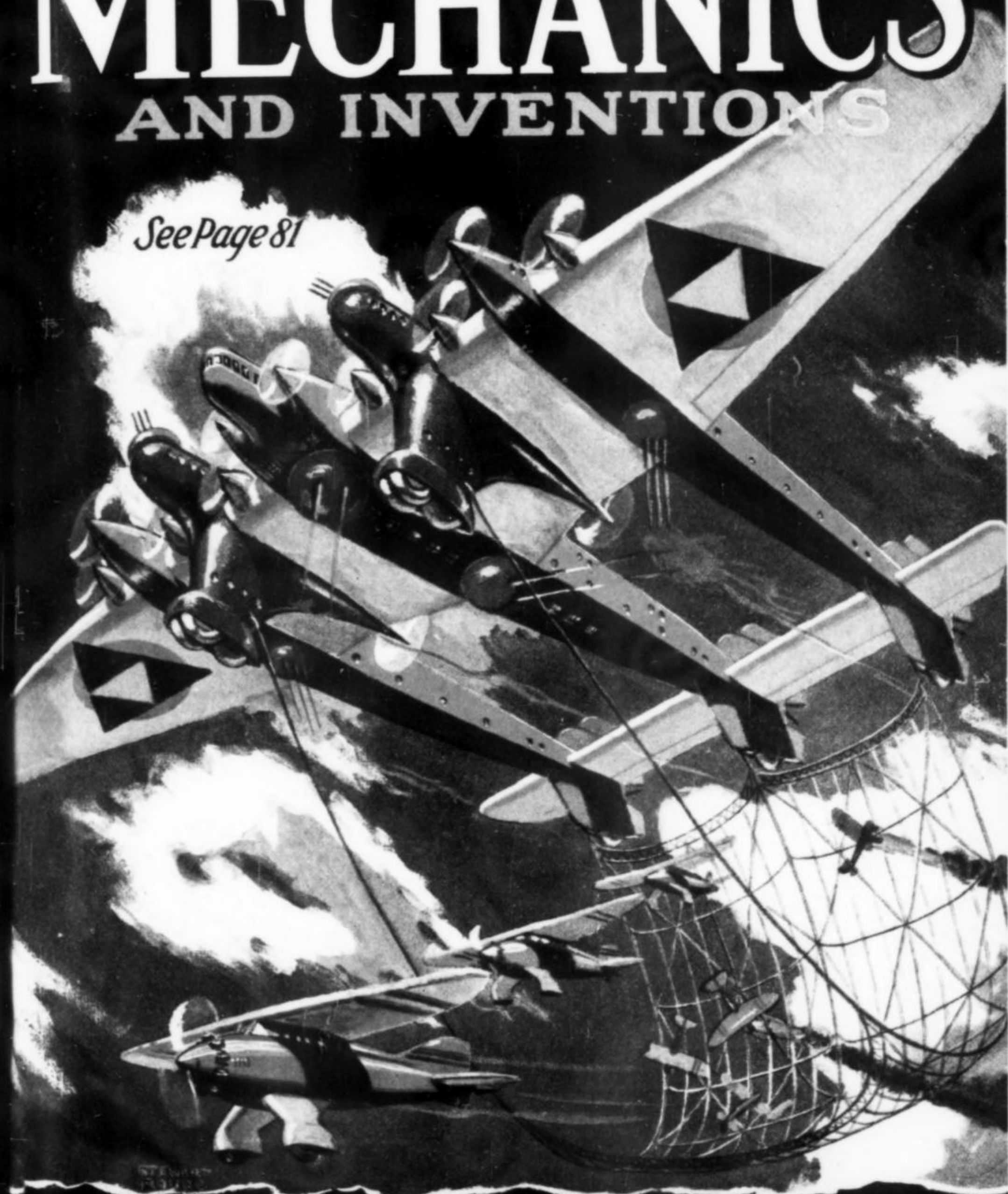
15—One motor for the rotation about the axis 3-3 to produce variation in geographical latitude.

16—Contact points to connect fixed electrical wires with the rotating parts.

MODERN MECHANICS AND INVENTIONS

DEC
25

See Page 81



GANGLAND'S DEATH MACHINES

DECEMBER
1928

Vol. I No. 7

MODERN MECHANICS

AND INVENTIONS

A FAWCETT
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Floating Hotels of

CROSSING the Atlantic in 50 hours, in the huge air liners being built in England and Germany, will soon be achieved, marking the most revolutionary step in aeronavigation since the invention of the airplane. All the luxuries of a first class hotel are offered in these leviathans of the air.

WILL the new mammoth airships under construction in England and Germany confound the critics and prove the commercial possibility of world travel in huge liners? That is the question to which an answer is anxiously awaited by thousands of interested people.

In face of the disasters which have previously attended large-scale experiments of the kind, and in spite of predictions of failure, the British Air Ministry believe the problem of building safe dirigibles can successfully be solved. They are demonstrating their belief by building two amazing ships which will soon be ready to make their trial trips.

The new airships are fascinating in their

bold conception and the ingenuity of their design. The British Ships are known officially as "R 100" and "R 101." The German airship is the "Count Zeppelin," which recently completed its trial flight of 650 miles in less than seven hours and is now ready for service.

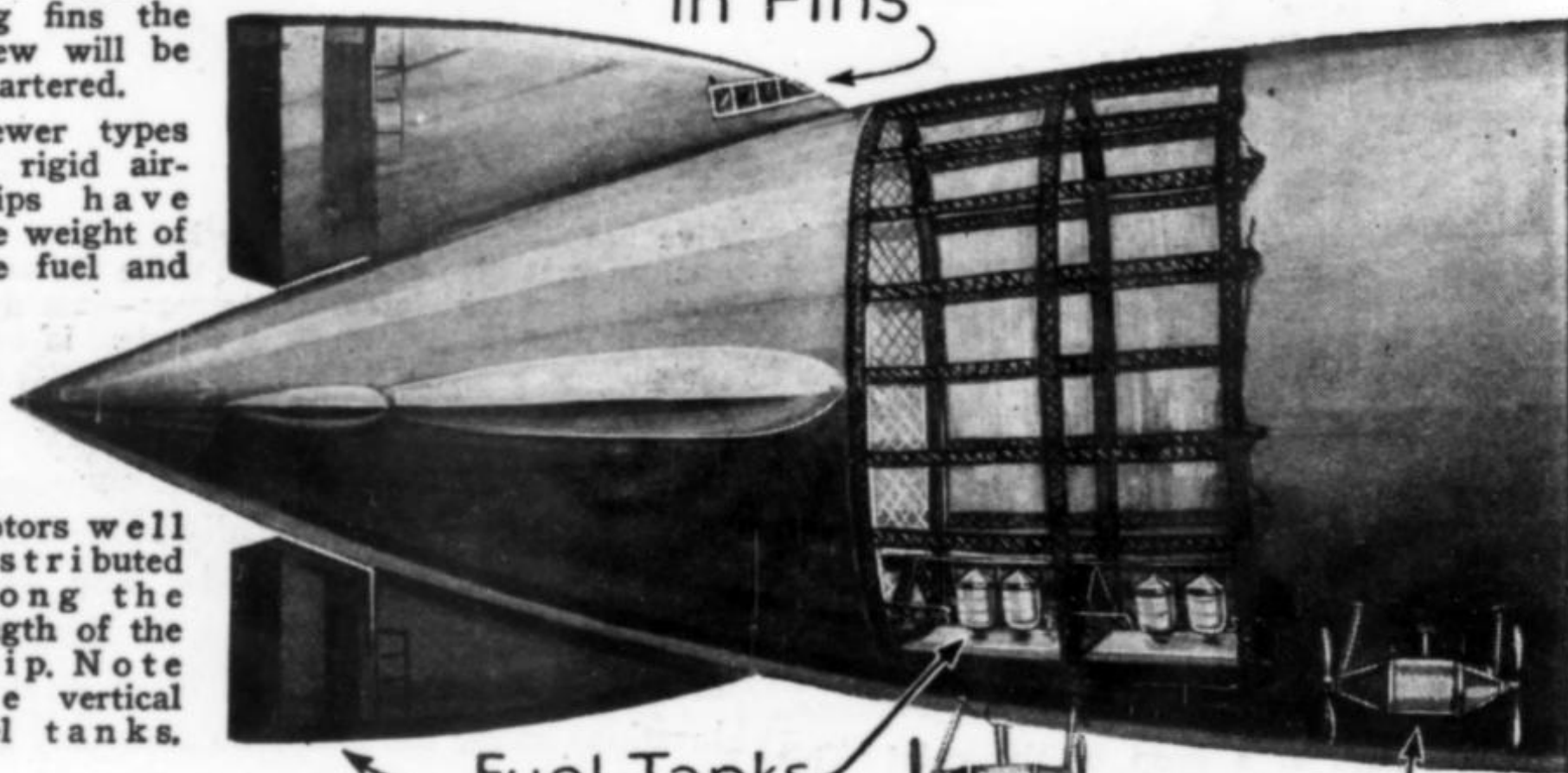
The "R-100" follows the well-known Zeppelin practice in certain features of her design. The longitudinal girders are of the customary triangular form, but novelty is introduced by making both the girders, and the frame rings, in separate units, held together by detachable joints. If any girder becomes damaged, it can easily be replaced, without having to cut out the dam-

In the thick portions of the stabilizing fins the crew will be quartered.

Newer types of rigid airships have the weight of the fuel and

motors well distributed along the length of the ship. Note the vertical fuel tanks.

Crew's Quarters
in Fins



Fuel Tanks
Rudder

Motors

Cloudland

by PERCIVAL MARSHALL

London Engineer

aged part and rivet a new length in its place. The metal used is duralumin. The booms of the girders are circular in section, and are formed by rolling up a long strip of sheet metal spirally, so that the edges overlap. These overlapping edges are then riveted together.

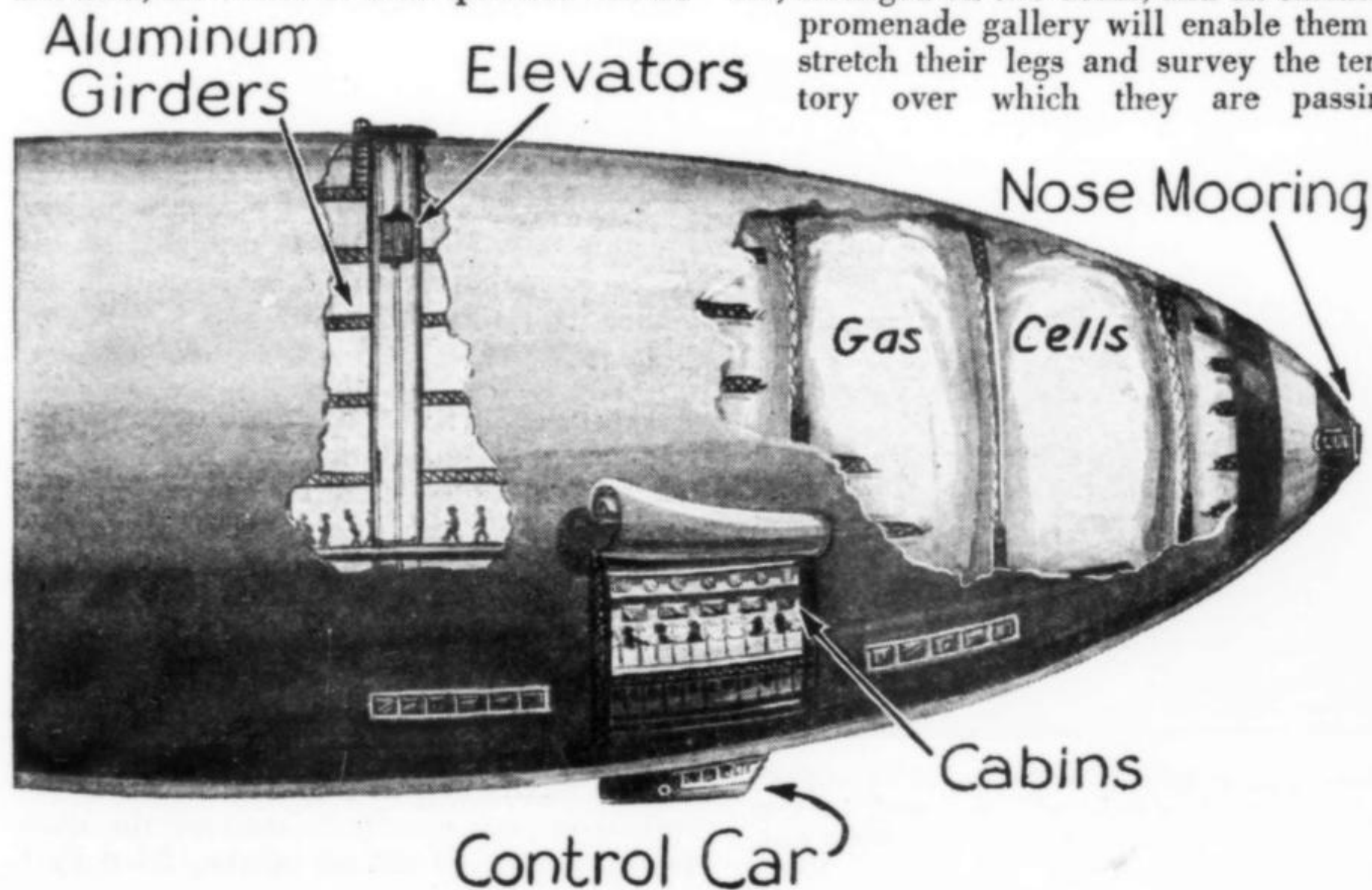
Each longitudinal girder is built up with three of these booms, joined together by lattice work, and the girders are all curved to a streamline form. This added much to the work of construction, but it is anticipated that the reduced air-resistance offered by the body of the ship will fully compensate for the extra cost and trouble involved.

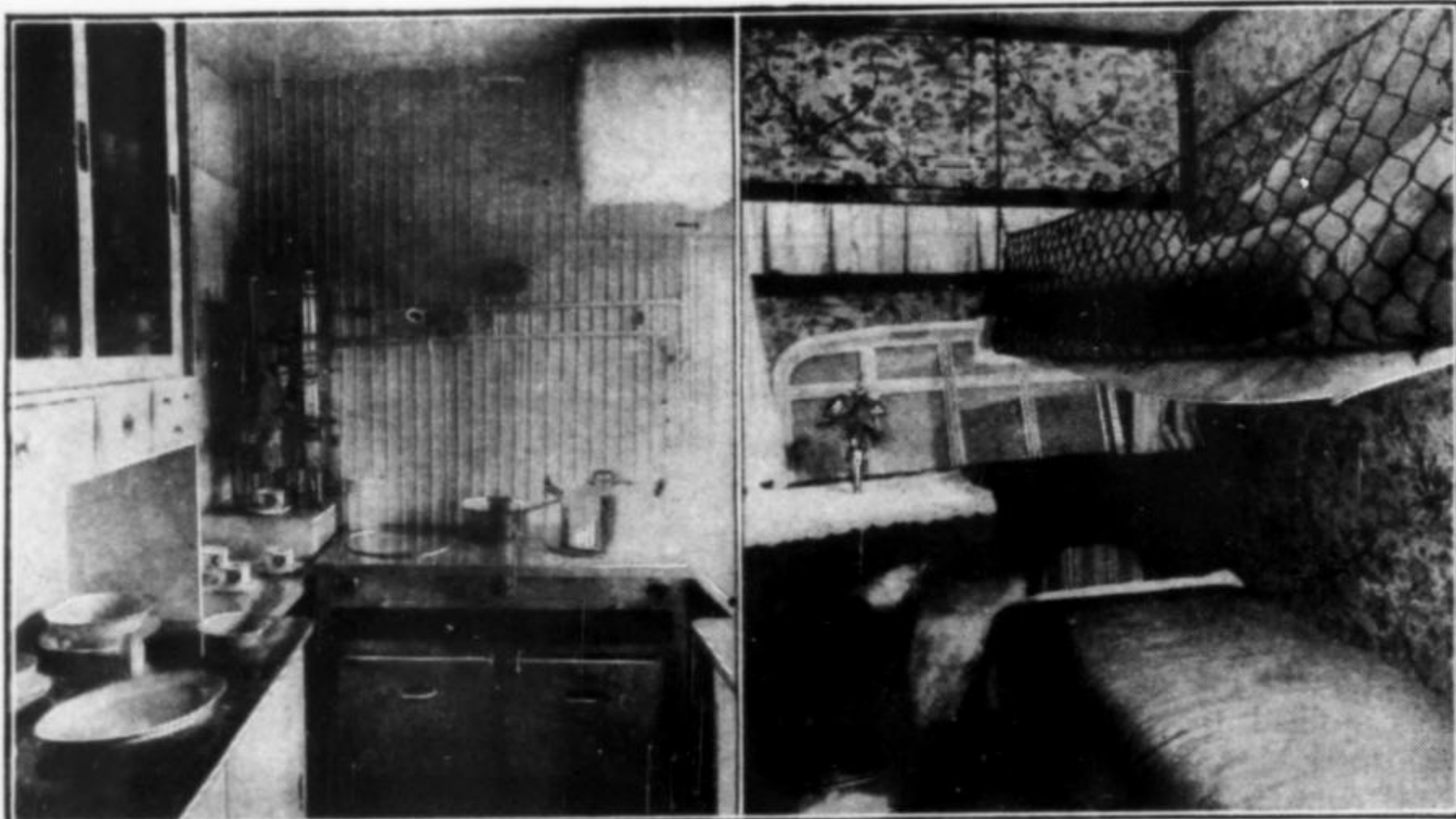
Luxury is the keynote for passengers. Contrary to previous practice in air liners of this kind, the whole of their quarters will be



This is an actual photo of the luxurious salon of Germany's latest liner of the sky, the super-rigid Count Zeppelin. One would think it a view of the drawing room of some stately ocean liner rather than the accommodations afforded by a passenger-carrying hotel of the sky!

situated within the main framing of the ship. They will sleep in cosy two-berth cabins, arranged on two decks, and an extensive promenade gallery will enable them to stretch their legs and survey the territory over which they are passing,



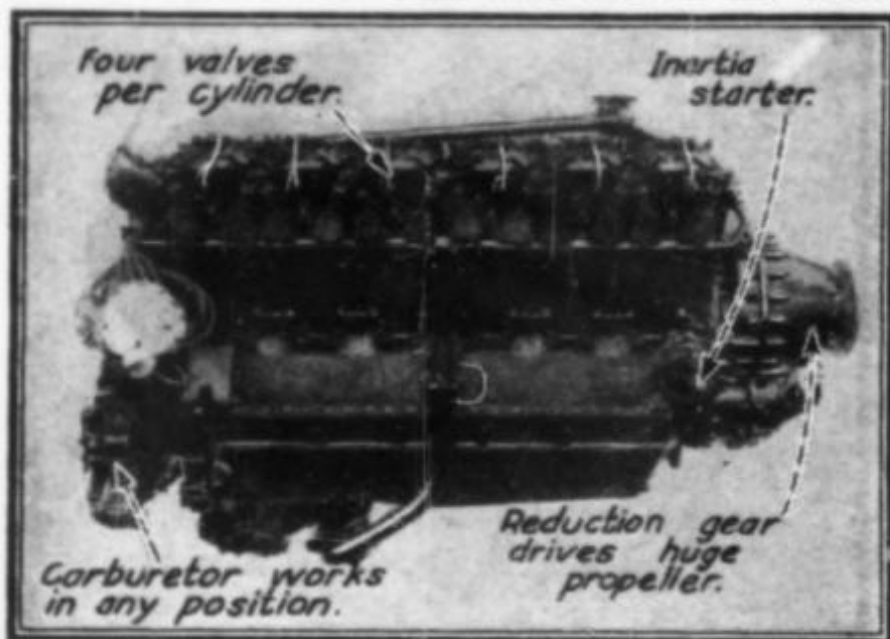


The left view shows the galley of the Count Zeppelin. The extensive use of aluminum to make bulkheads, tables and tanks is well shown. At the right is one of the berths in a stateroom on the same airship.

—International Newsreel.

Meals will be prepared by an expert chef in an all-electric kitchen, and they will be served at table under conditions similar to any first-class restaurant. They may even have their game of bridge, but I doubt whether the designers of the ship will permit any sky-high dancing. Fifty couples stepping out the "Yale Blues" might do more damage than the fiercest Atlantic gale.

The crew and the main controls of the ship will also be housed within the hull. Engine nacelles, or "power-eggs," of which there will be three, are located one at each side of the center line and one at the stern.



Salient points of the Rolls-Royce "Condor" engine, six of which will be used in the R-100. These motors are twelve cylinder and develop 650 h. p.

Each engine nacelle will house two Rolls-Royce Condor gasoline engines, of 700 horse power each, so that 4,200 horse-power will be available from the six engines.

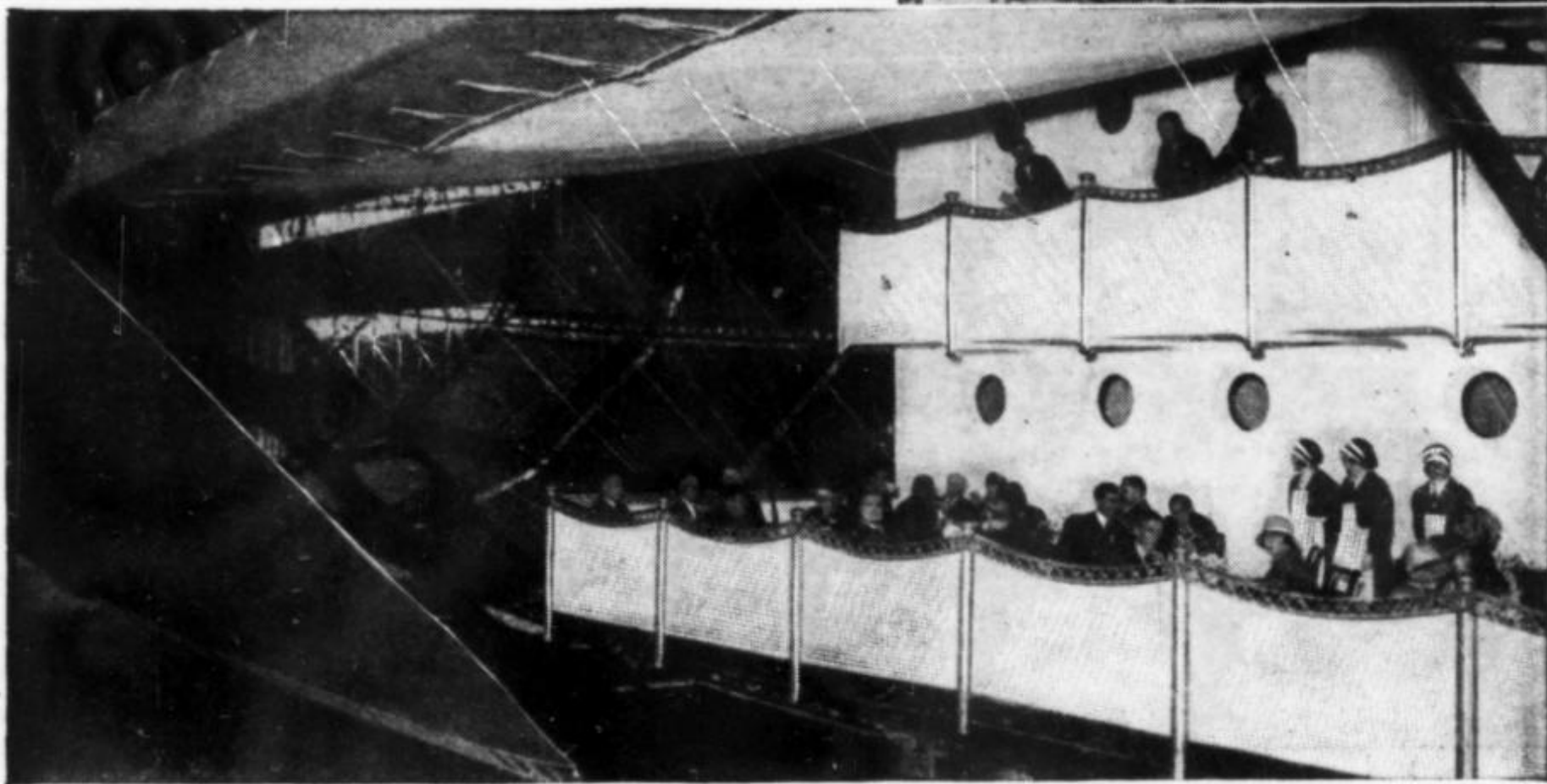
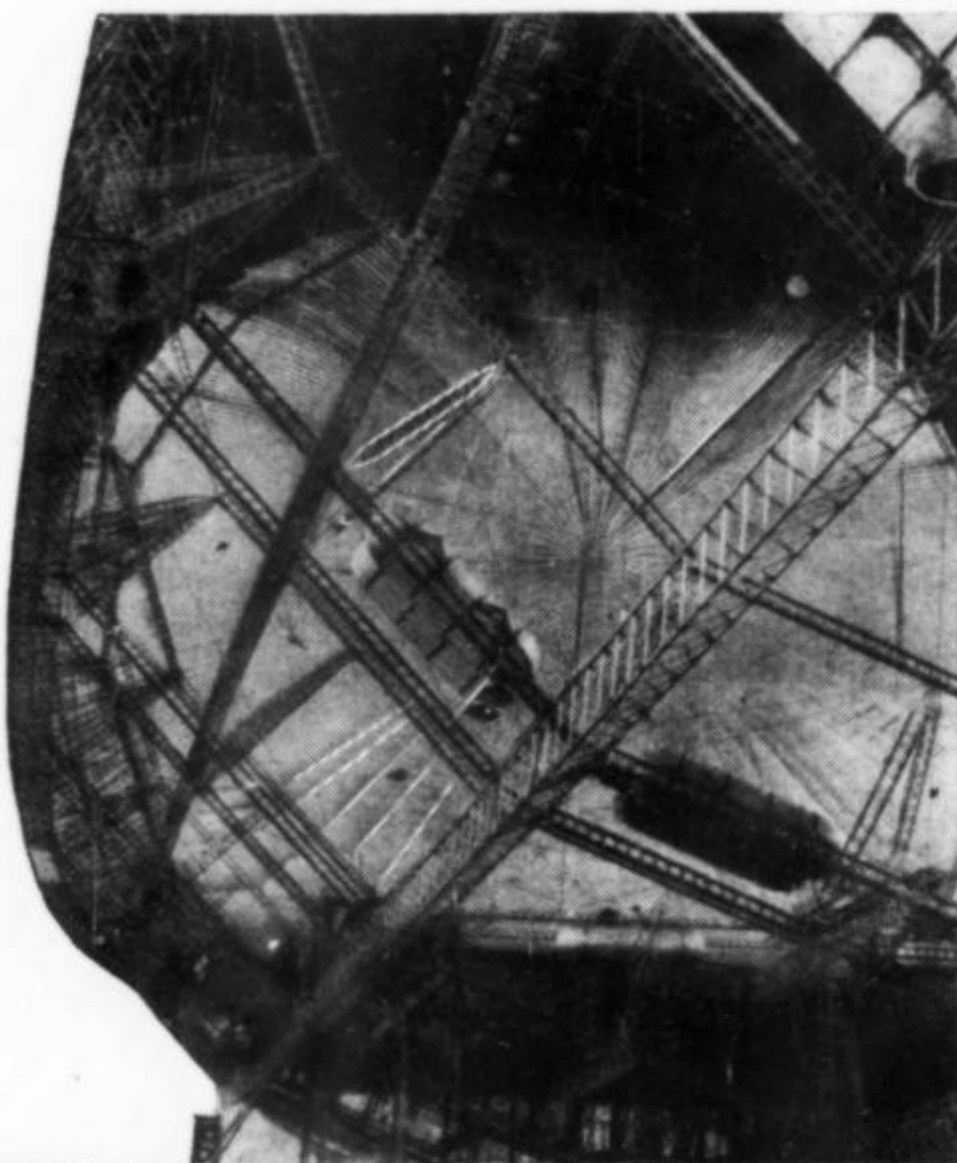
The length of "R 100" is 709 feet, and the maximum diameter 130 feet. The displacement is 5,000,000 cubic feet. It is estimated that the maximum speed will be about 82 miles per hour, and at a cruising speed of 75 miles per hour, the ship will be able to undertake a fifty-hour flight, covering 3,750 miles. Thirty tons of fuel will be required for this trip. The ship is designed to lift 73 tons, including the crew and fuel, together with 100 passengers and ten tons of freight.

The R 101 will have girders of steel tubing instead of duralmin, and crude oil will take the place of gasoline as fuel for the engines. This use of the crude-oil engine is an interesting and important experiment, since it will make the ship much safer for travel in hot countries, and will do much to improve the condition of the atmosphere in the accommodation quarters. Five Beardmore engines will be used for propulsion, and an auxiliary gasoline engine will be installed in each nacelle to start up the main power plant. Crude oil costing 25 dollars

a ton will be used. Enough fuel will be carried to give a cruising range of 4,000 miles. The air-screws have blades of variable pitch; these can be reversed and, if desired, can also be set in a neutral position giving no thrust at all. Special valves are provided to release gas automatically in the event of a sudden rising of the ship through the action of vertical air currents. These valves can also be operated from the main control cabin. To trim the ship, the water ballast, and if necessary the whole of the oil fuel, can be blown from tank to tank throughout the length of the vessel by means of compressed air. The sixteen gas bags are lined with gold-beater's skin. To obtain the vast amount of skin, no less than twenty million cattle have been utilized. Prodigious as this seems, it is probably not an exaggeration.

Eventually, according to present plans, the R 101 will tour the British Empire, and mooring towers are being erected at Ismalia in Egypt, at Karachi in India, at St. Hubert in Canada, and near Durban in South Africa. Sites for towers have also been earmarked at Perth in Australia, and in New Zealand.

The R 101 is slightly larger than its sister ship R 100, being 730 feet in length, but the diameter is the same. The increased length will provide rather more spacious accommodation for the passengers. The dining-room, seating 50 people, is on the upper deck, where there is also a large lounge. Steam radiators warm the ship.



Promenade decks give the semblance of an ocean liner on the R-100, England's mammoth airship. Glass will cover the hull at this point. Above is shown structure of the gas cells in the new R-100 being built in England. The gas bag can be clearly seen. Gas tanks on the girders are fitted with quick dump valves.

FLYING Forts of the

By MAJOR H. H. ARNOLD

Assistant Chief American Air Service During the World War

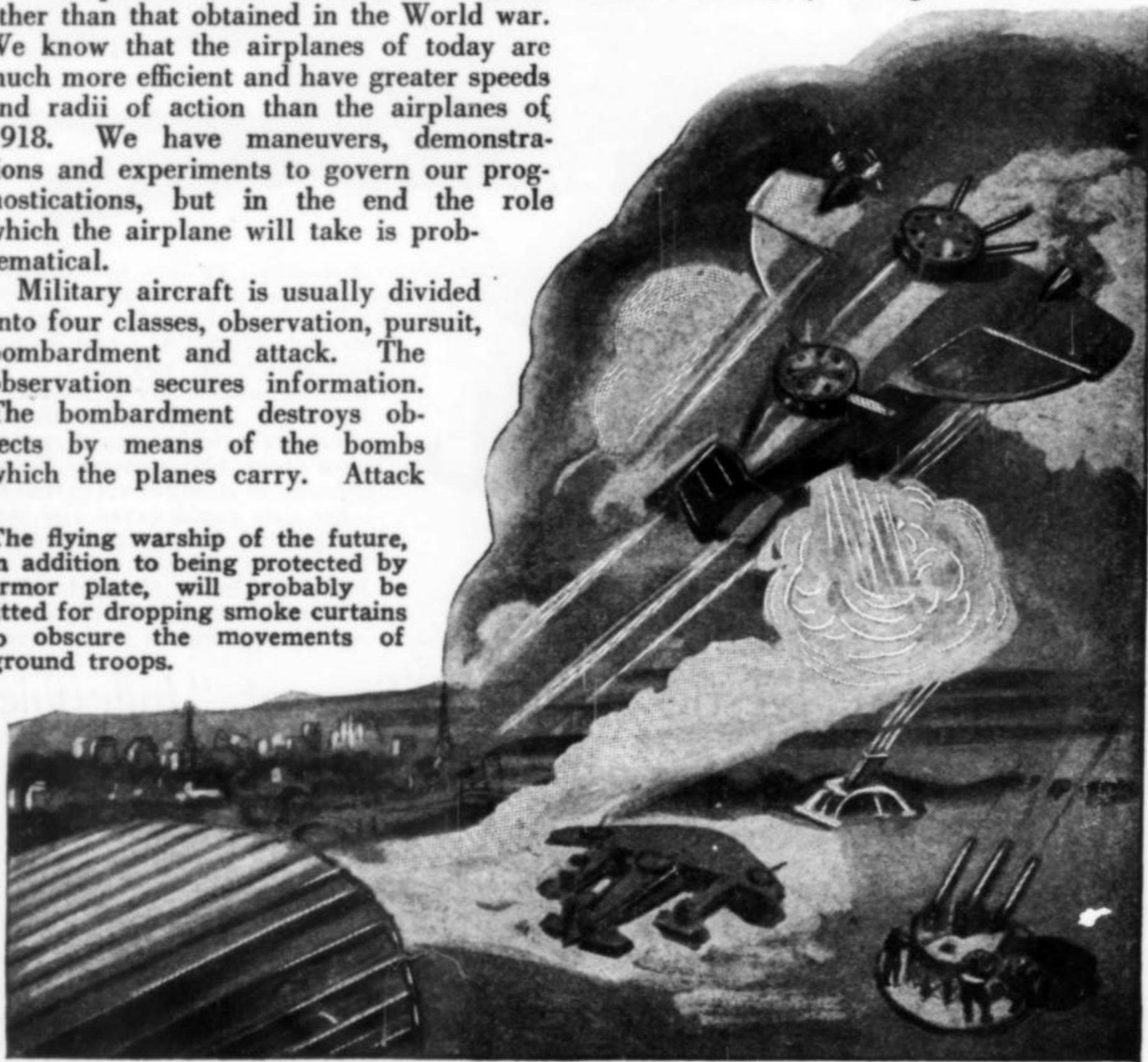
WHAT will the fighting airplanes of tomorrow be like? Will wars of the future be fought between armored battleships of the sky? Major Arnold, one of America's best known authorities on military aeronautics, here makes some interesting predictions as to the part airplanes will play in wars to come.

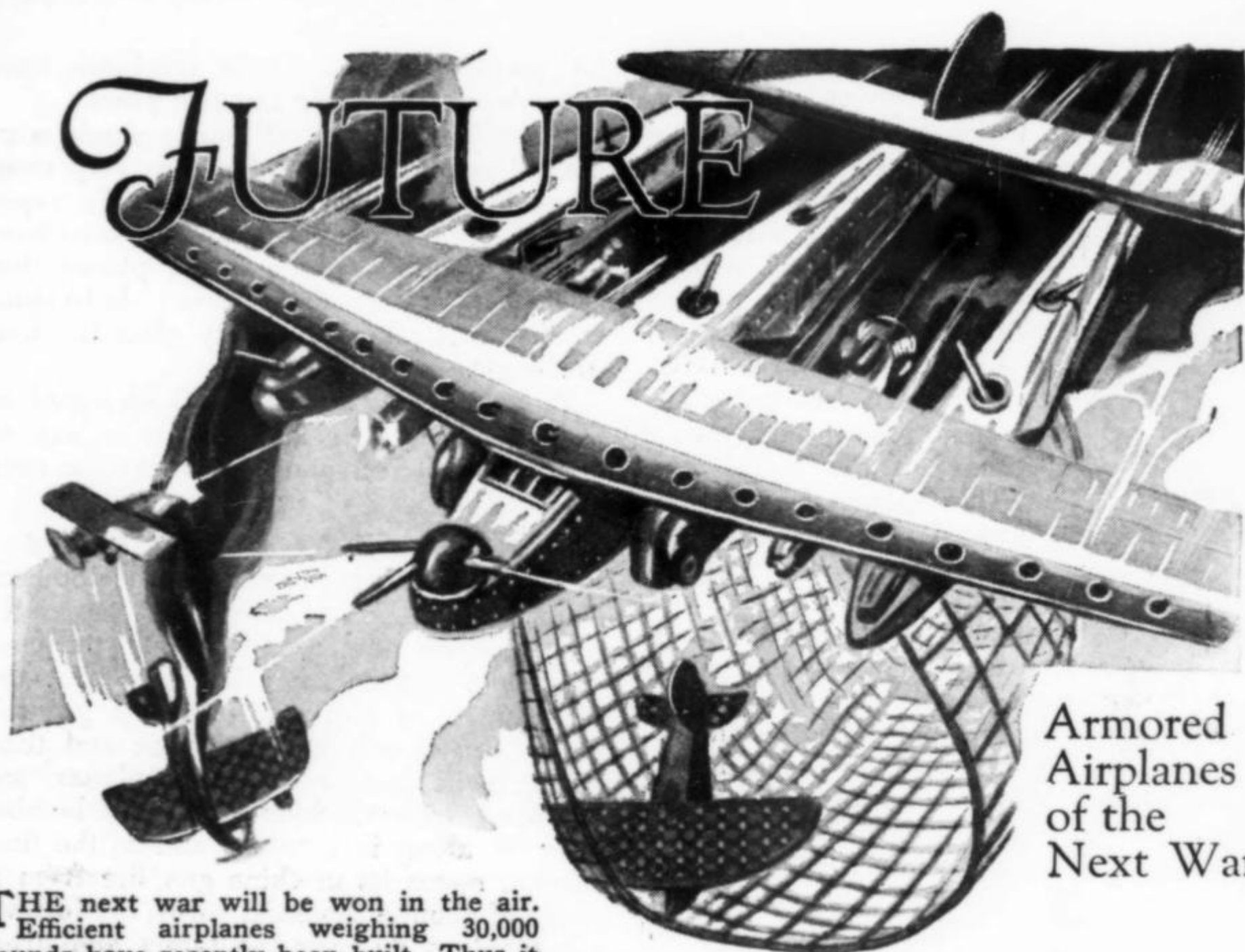
AT THE present time we have no precedents for the results which may be expected from aircraft in warfare other than that obtained in the World war. We know that the airplanes of today are much more efficient and have greater speeds and radii of action than the airplanes of 1918. We have maneuvers, demonstrations and experiments to govern our prognostications, but in the end the role which the airplane will take is problematical.

Military aircraft is usually divided into four classes, observation, pursuit, bombardment and attack. The observation secures information. The bombardment destroys objects by means of the bombs which the planes carry. Attack

The flying warship of the future, in addition to being protected by armor plate, will probably be fitted for dropping smoke curtains to obscure the movements of ground troops.

aviation destroys and delays troops and destroys lightly constructed ground installations. Pursuit, by driving down hostile air-





THE next war will be won in the air. Efficient airplanes weighing 30,000 pounds have recently been built. Thus it is entirely probable that the next war will see huge armor-plated machines such as this take the air over enemy territory, equipped with cannons and gas bombs, and possessing protective devices such as an electrified drag-net suspended from the fuselages which will have the power of crippling enemy aircraft by setting fire to their wings.

craft, furnishes protection to both ground and air organizations from aerial attack. Such are the types of aircraft with which the supreme commander of the future will protect his own troops and destroy and delay those of the enemy.

Observation aviation will be used from the day war is declared in all future operations. Observers will be sent beyond the sphere of action of the armies and navies to determine the location, strength and composition of hostile forces. The information which they secure will be sent back by radio or given verbally upon the return of the mission.

Staff officers and even the commanders themselves will take the air to get first-hand information regarding their own or hostile troops. Some of these planes will undoubtedly be shot down, but these aerial eyes will be so effective that practically all troop movements will be made at night.

Observation planes will operate from altitudes of two or three hundred feet above

the ground to heights of ten or twelve thousand feet. High above those planes there will be the photographing planes taking pictures of features of military value.

Taking Photos 250 Miles Away!

New developments in photography are making their appearance daily. The newspapers recently told of a camera which could take pictures of objects 100 to 250 miles away. In order to work this camera, the airplane will have to climb to an altitude of 20,000 or more feet. Hovering over New York, the airman will be able to take a picture of Philadelphia or Boston! Such a proceeding is almost beyond human comprehension but it is a present day possibility.

Then again, there is that device which enables the aerial photographer to take photographs on the darkest nights. The airman takes a large bomb of flash-light powder and trails it behind the plane. When he

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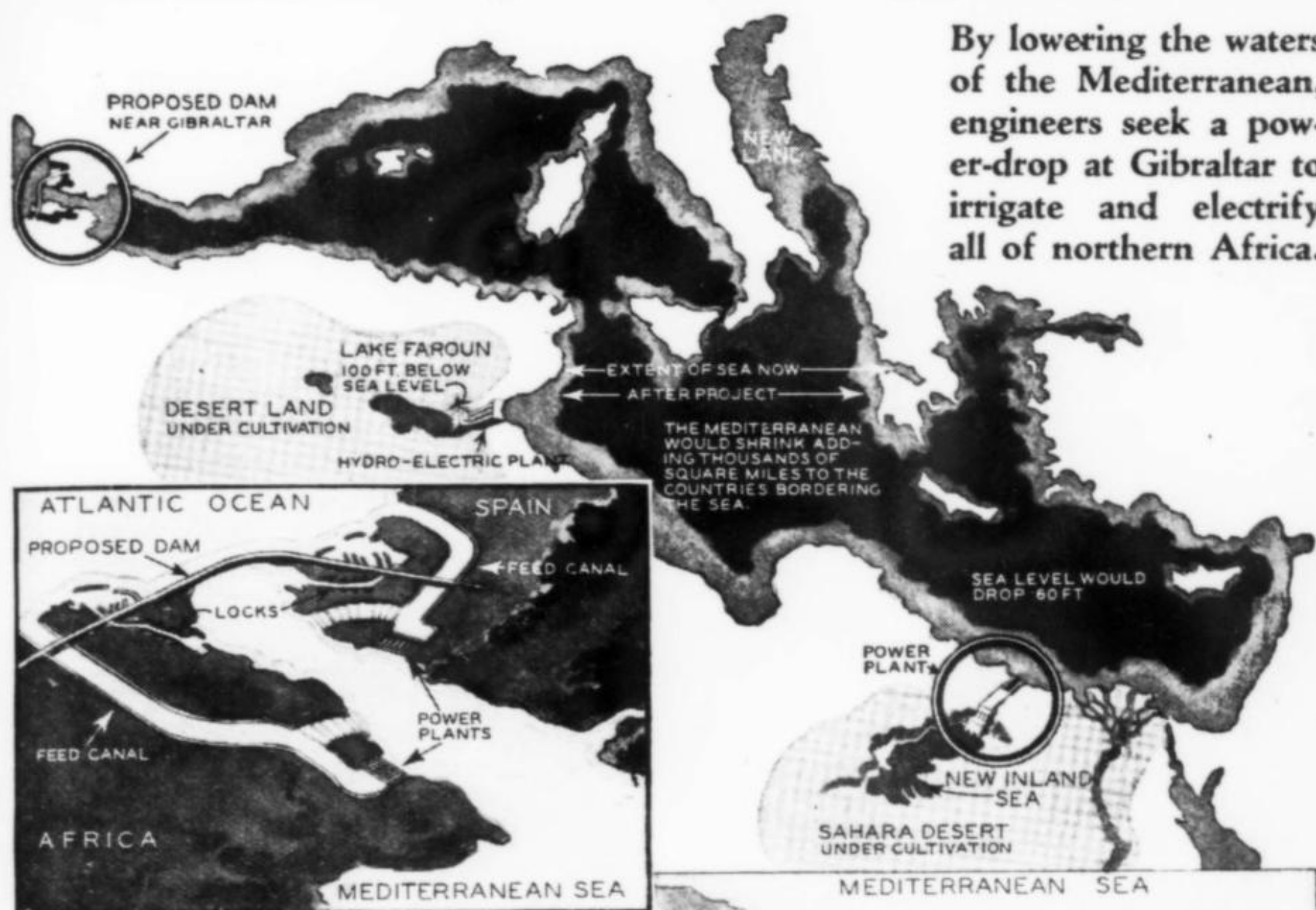
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Twin Dam Projects May Reclaim Sahara

By lowering the waters of the Mediterranean, engineers seek a power-drop at Gibraltar to irrigate and electrify all of northern Africa.



Large drawing above indicates how Mediterranean will be lowered to provide power-drop at the proposed Gibraltar dam, which is shown in the insert.

THOUSANDS of acres of desert land may be reclaimed, industry revolutionized and the Mediterranean coastline changed if twin engineering projects, now under consideration, are carried to completion.

The major plan calls for the construction of a giant dam across the Straits of Gibraltar and the lowering of Mediterranean waters to provide a power-drop which would irrigate and electrify northern Africa.

To bring the level of the Mediterranean low enough to set up a fall of Atlantic ocean water at Gibraltar, two canals are to be dug at points indicated in the large drawing above. Both canals lead into desert collecting basins far below sea level.

When the waters of the Mediterranean have been dropped about 60 feet below their present level, vast amounts of power will be available at the Gibraltar dam; and it is estimated that the problem of irrigating the Sahara will have been solved. In addition, virtually unlimited electric power will be available to industry and thousands of acres of land now under water will be opened to cultivation as the Medi-

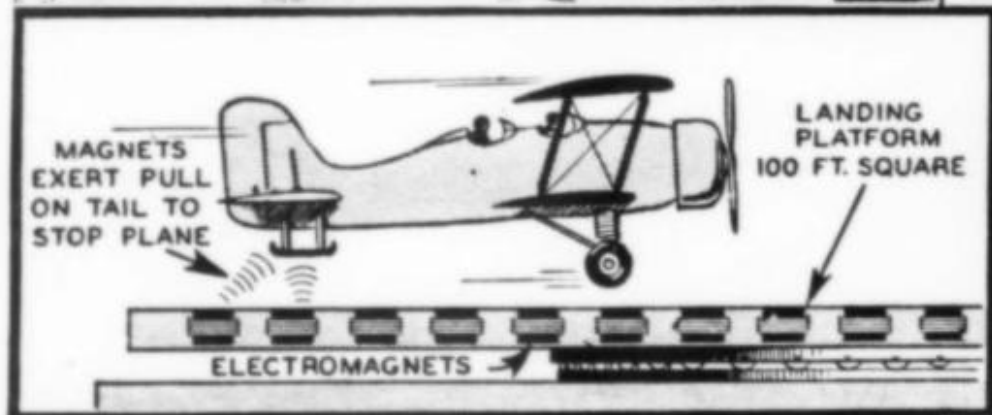
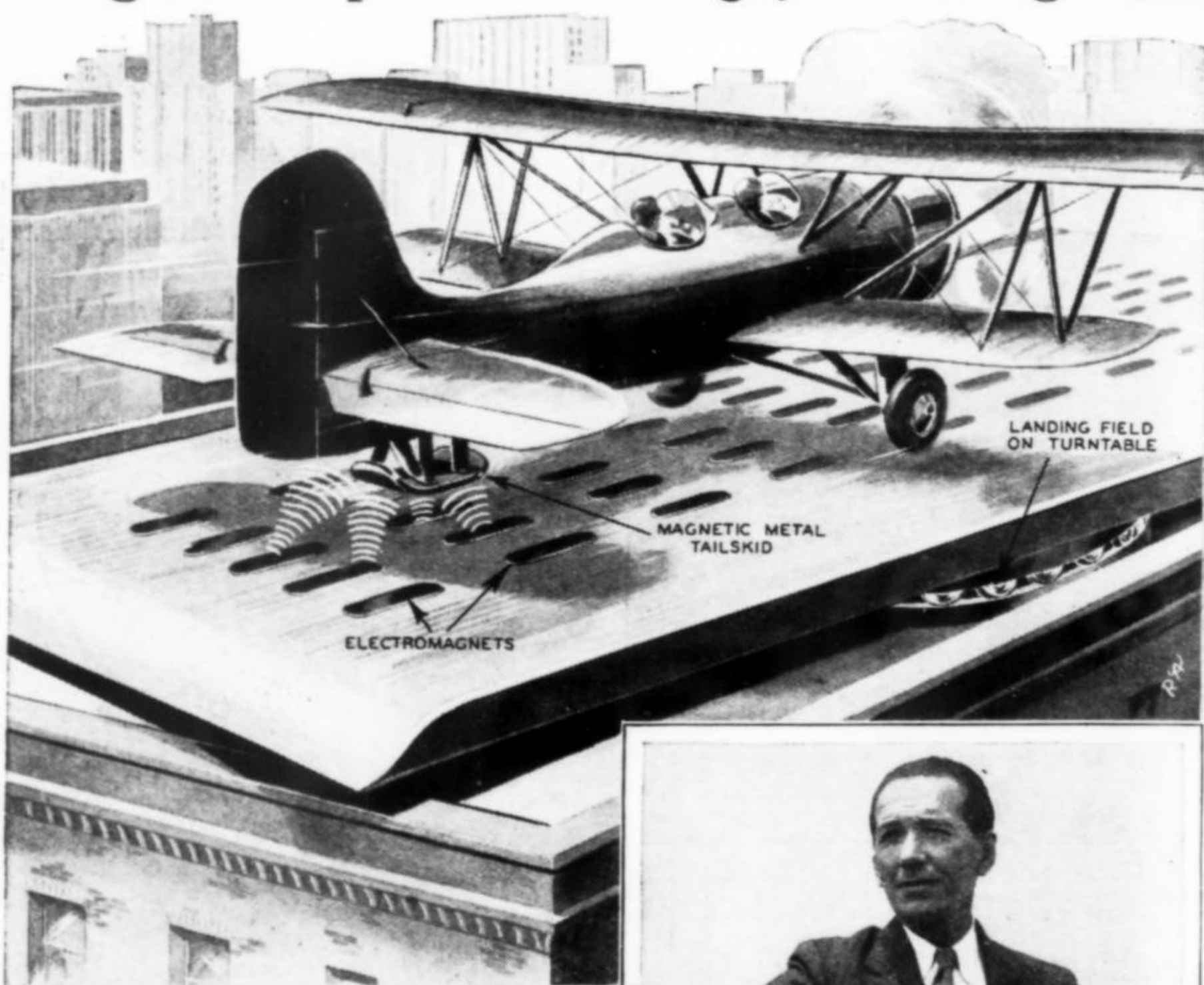


By dropping Mediterranean waters through forty miles of 40-foot tunnels into the Qattara depression, enough power will be generated in the future to electrify and irrigate all of Lower Egypt.

terranean recedes, forming new coast line.

The secondary project is a hydro-electric scheme to supply power for Lower Egypt by bringing the waters of the Mediterranean, by canal and tunnel, into the Libyan desert, there forming a vast salt-water lake in the Qattara Depression, a huge sink about 200 feet below sea level. At the point where the water drops from the tunnels into the Qattara a power plant is to be built, whose output would render Egypt independent of imported fuels for irrigation, drainage, and various other projects.

Magnets Stop Plane on Roof Landing Field



Powerful magnets in the new rooftop landing platform are forcing the plane in the picture above to a quick stop. The cross section shows the turntable and the magnets which exert a cross-wise pull on tail skid, stopping plane.

A NEW magnetic brake makes every roof 100-foot square a possible landing field for airplanes.

With this landing platform, the invention of Yosemite Nabona, a Navajo Indian, airplanes can be brought to a quick stop in the short space of 100 feet. Powerful electro-magnets, set flush with the landing surface, exert a powerful pull on the metal tail skid of a ship, and force it to stop quickly.

The electro-magnetic braking device presents the possibility of solving the old problem of finding space for airports as close as possible to the business districts of cities.

The private plane owner, living miles



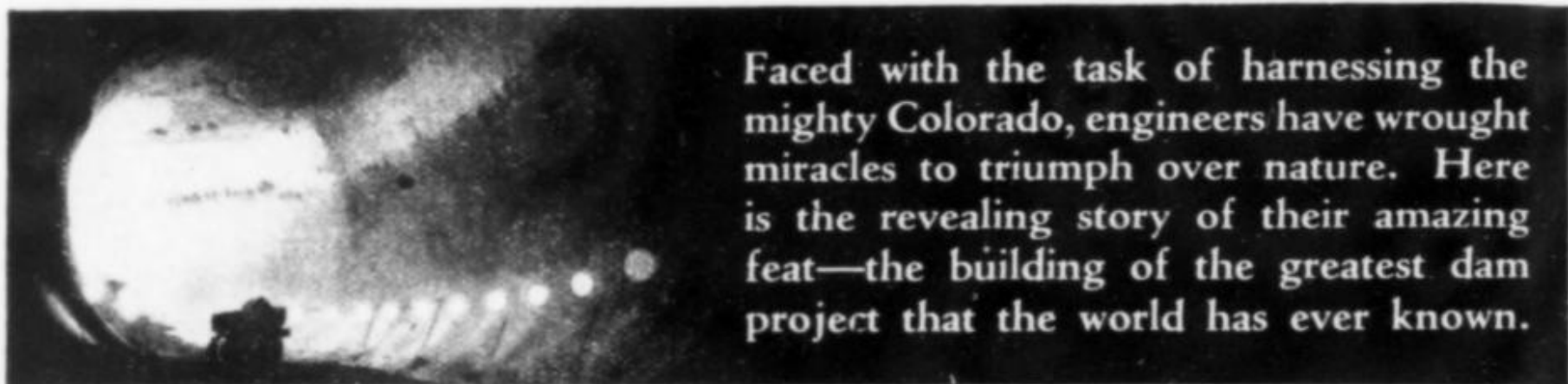
Yosemite Nabona, a Navajo Indian, is shown above with a model of his magnetic airplane brake, which makes every rooftop 100 feet square a possible landing field.

from air fields, can also benefit with the invention. He can actually become an air commuter as roof sites can be selected within a short distance of his home and office.

The long magnets of the platform exert a gradually increasing crosswise pull on the plane's tail skid to bring the ship to a quick stop.

The platform is equipped with a turntable so that all landings can be made into the wind. Nabona was adopted by a German family and educated abroad.

The AMAZING STORY



Faced with the task of harnessing the mighty Colorado, engineers have wrought miracles to triumph over nature. Here is the revealing story of their amazing feat—the building of the greatest dam project that the world has ever known.

RUNNING wild and free for countless centuries, carving a breath-taking gorge through massive cliffs of volcanic rock, the turbulent Colorado river is being tamed by men and machines in a gigantic battle which will end forever the recurrent droughts and floods which have devastated the Southwest.

The story of the Colorado's conquest is the most colorful epic in the history of civil engineering. Other giant dams have spanned mighty rivers but Boulder Dam dwarfs them all. Its height, 730 feet, is nearly twice that of any other dam. Its reservoir, 115 miles long, will form the largest artificial lake in the world. Its potential output of 1,800,000 horse power is more than twice that of Muscle Shoals and Niagara Falls. Everything about the dam is on a superlative scale—of a size and grandeur that is as unbelievable as it is amazing.

To begin with, engineers had to excavate four of the largest diversion tunnels the world has ever known, to shunt off the waters of the stream which

have been known to develop a flow of nearly a quarter million cubic feet per second at flood time. These tunnels, which left the river bed dry for construction work, were 50 feet in diameter and 4000 feet long. Four hundred thousand cubic yards of gravel and broken rock were taken from the river's bed before the first concrete was poured in June, 1933. Yet today general construction work is fully a year ahead of schedule.

Concrete pouring goes on day and night in three eight-hour shifts. Giant carriers scream out over the canyon on steel cableways, swinging 20-ton buckets which pour out 8 cubic yards of concrete on each three-minute trip. In May, 1935, when the last bucketful is expected to be poured, 7,000,000 tons of concrete will have been used—enough to build a 16-foot highway from Seattle to Florida.

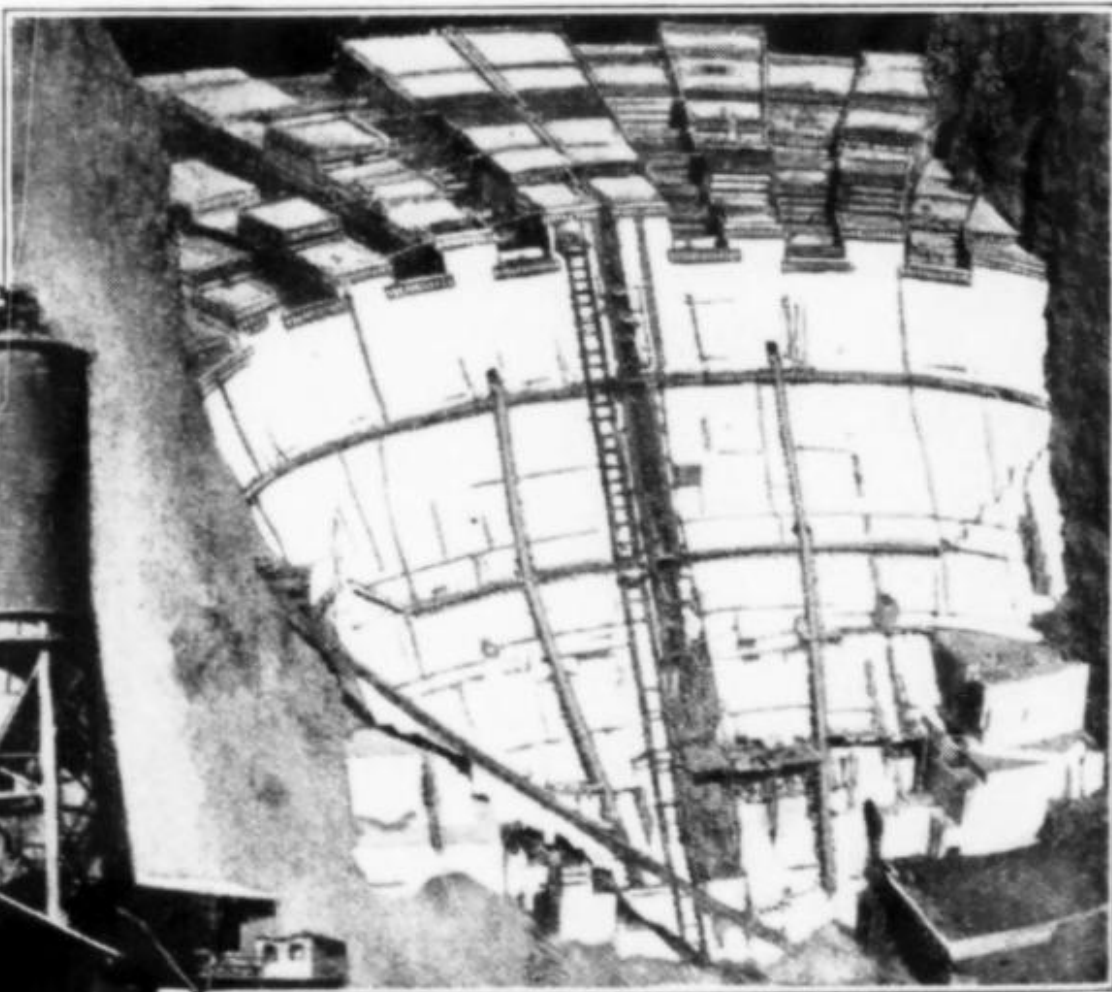
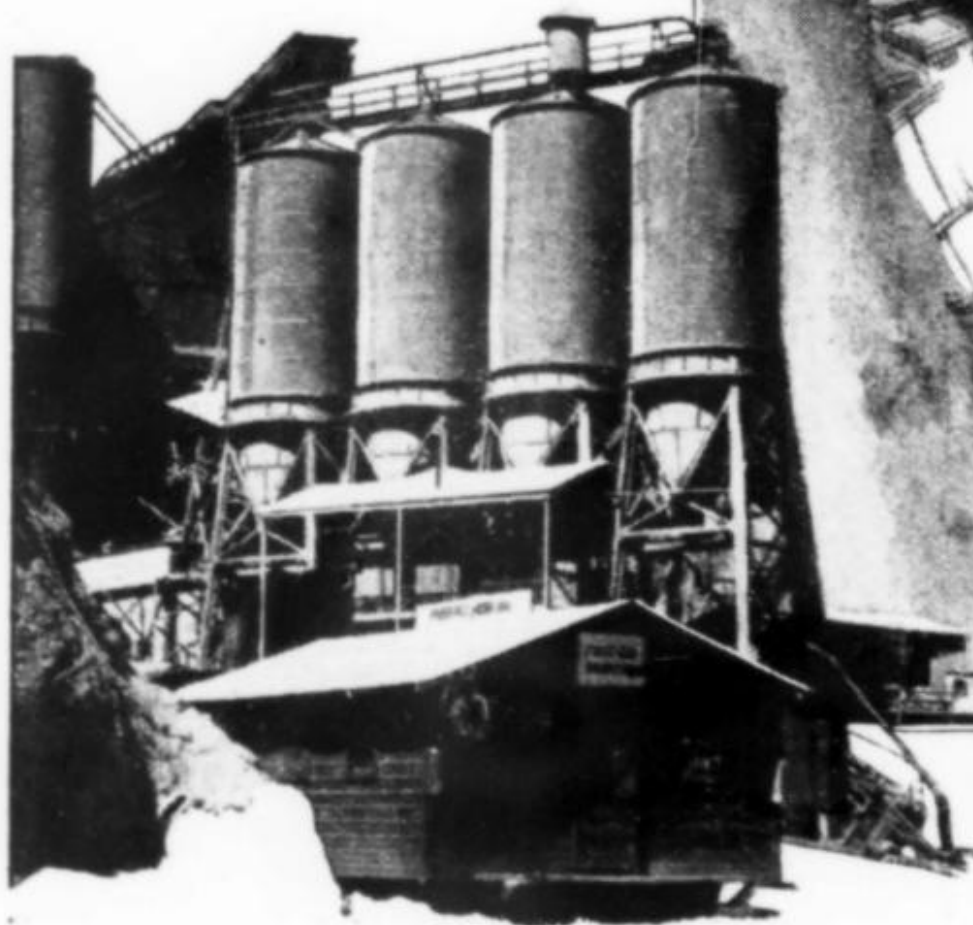
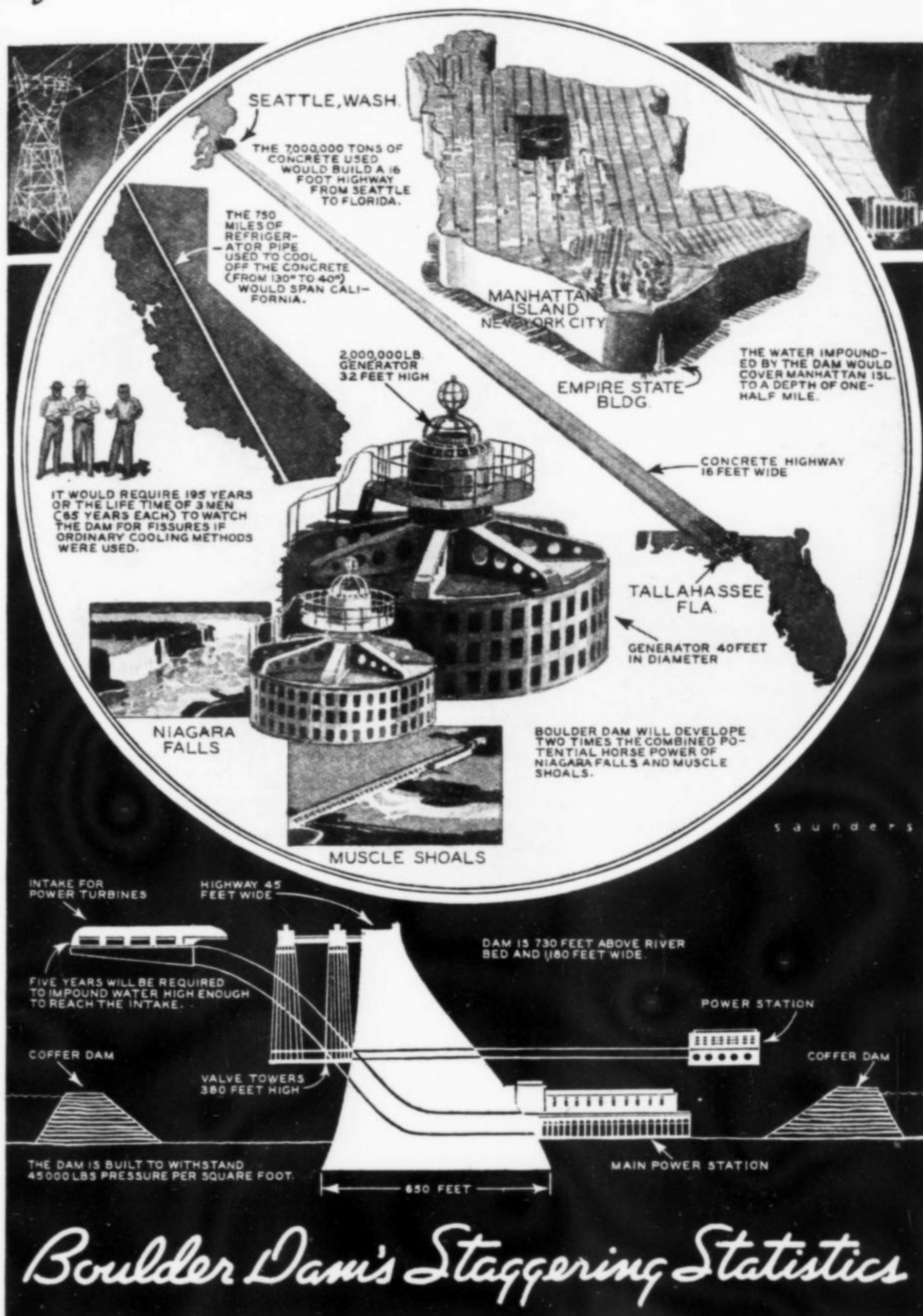


Photo at top of page shows a truck passing through one of the completed tunnels. Left, the largest concrete mixing plant in the world, on the edge of Black Canyon, on the Nevada side of the dam. Directly above is a picture of Boulder Dam today.

of BOULDER DAM by MEL WHARTON



The drawing above illustrates, in graphic fashion, the stupendous scale upon which Boulder Dam is built. The last concrete is expected to be poured in May, 1935, but the mammoth basin will require at least another five years to fill.

Inventions for September

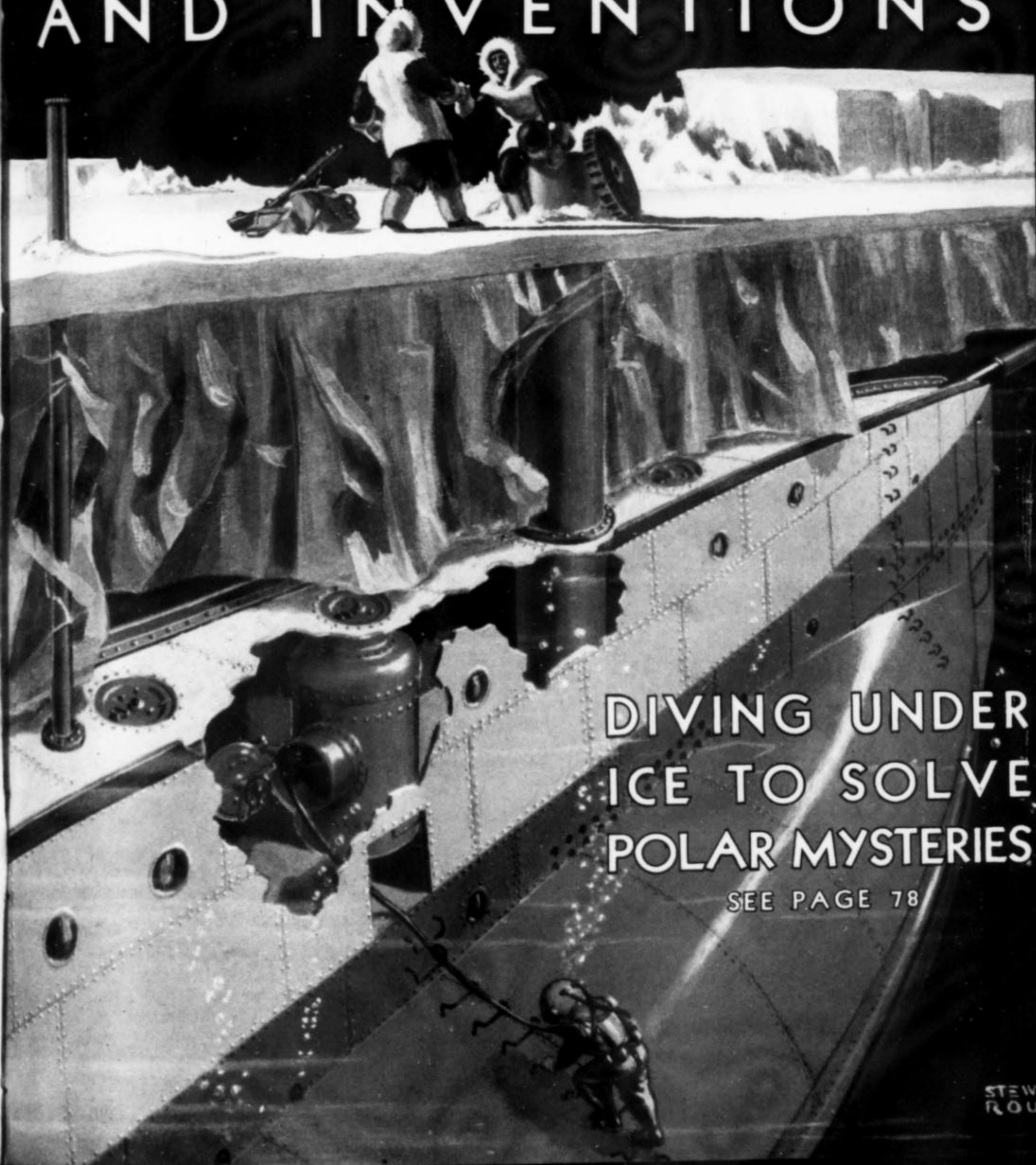
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Sham WAR Demonstrates



Photo shows bombers flying in formation over New York City in the First Air Division demonstration.

by CAPT. T. R. PHILLIPS, U. S. Army

Immense fleets of fighting planes directed in battle by radioed orders from a flying general—deadly new attack planes carrying a quarter ton of bombs and capable of firing 3000 shots a minute—these are a few of the latest developments in aerial warfare demonstrated in an amazing sham air war. Don't fail to read this authoritative article if you take pride in keeping informed on Uncle Sam's defense system.

STAGING the most amazing sham air war in all history, 672 fighting planes of the U. S. Air Corps, assembled from all corners of the country, recently engaged in mimic battle over the skyscrapers of New York, dropping dummy bombs on the financial district, laying smoke screens, attacking in formations, and otherwise demonstrating the latest developments in air attack strategy which will be used in the next war, if and when it comes.

New York is not the only city to witness this impressive demonstration. Even as you read these lines, the First Air Division will be repeating its performances over most of

the large cities of the nation. In fact, before the planes return to their home bases it is estimated that 70,000,000 people will have witnessed their maneuvers. More than 2,000,000 miles will be flown and half a million gallons of gasoline consumed.

What is the purpose of this vast concentration of fighting planes? It is not just an impressive aerial parade—it marks the end of that glamorous fighting era of the World War in which the flying heroes were the Rickenbackers, Guynemers, and Bishops, famous aces of individual combat. Those days are gone forever. The aerial heroes of future wars will be flying generals who direct



Typical methods of air warfare are illustrated in this drawing of the sham battle over New York. Note the three tiers of pursuit planes, protecting the bombers which fly at a low altitude to drop their "eggs." Smoke screens laid by plane hide the city from the enemy. The planes fly in group formation and act on radioed instructions from their flying leaders. Insert map shows route of sham attack.

Group of 100 Airplanes Can Bomb 14 Miles of Troops in One Minute



Attack aviation, in which low-flying planes drop bombs and spray ground targets with machine gun fire, is a post-war development of extreme importance. As shown above, an attack group of a hundred planes can bomb a 14-mile column of troops in one minute. The formation splits into three-plane elements, as shown in red, on signal from the attack leader.

thousands of plane units under their command with the skill of a Pershing or a Foch.

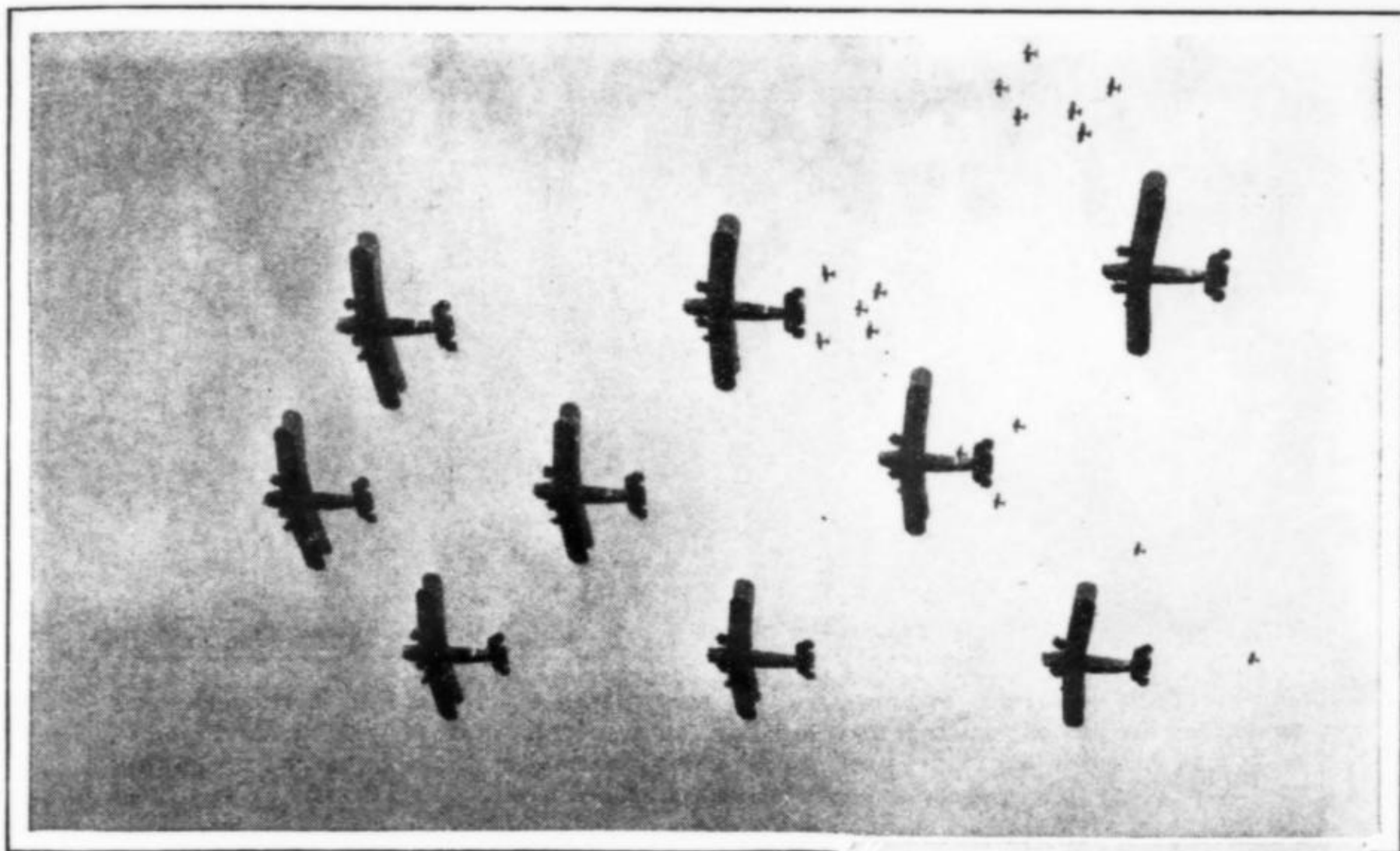
The First Air Corps demonstration is in reality a test of the new fighting strategy—the most severe test to which planes can be subjected outside of actual combat with an enemy. It will test the ability of flyers to work together in large numbers; it will test the feasibility of controlling an air fleet by radio; it will determine how well an armada of the skies can be serviced with gasoline and oil, and whether ground crews can keep the ships in good operating condition.

What are the latest developments in air warfare? The most conspicuous advance, as has been intimated, is the massing of planes in large numbers for formation attack. The flying circuses of the World War were the first efforts at formation flying, but they were not well developed because the leaders did not have radio equipment and so could not issue orders to a large group. Six planes are as many as can be well controlled by wing signals in the air. To radio, therefore, must go much of the credit for making the modern formation attack possible.

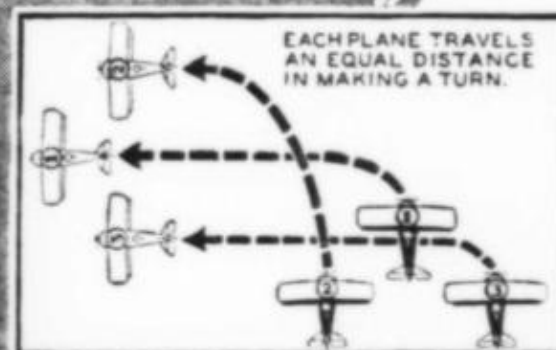
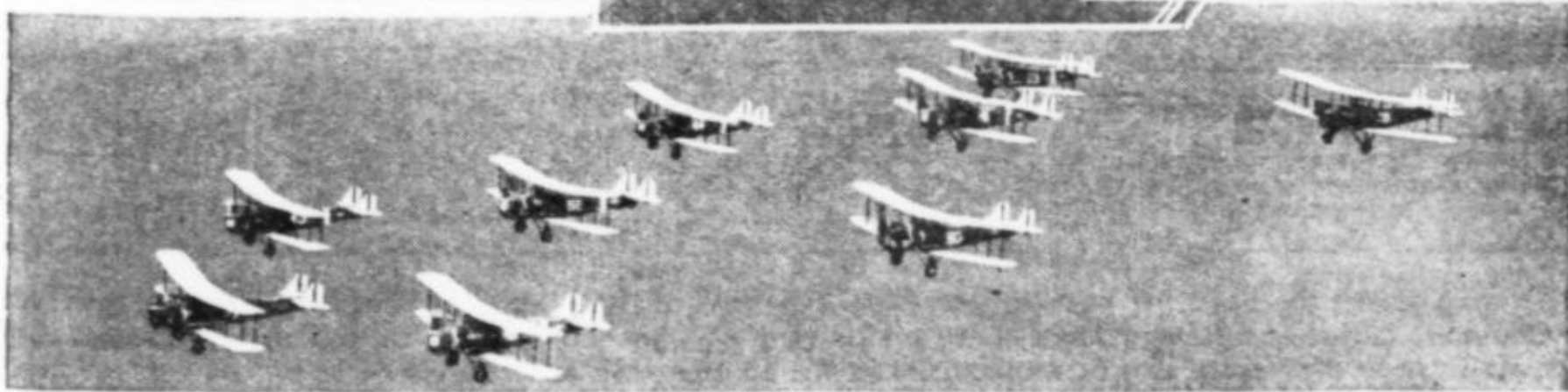
There are still problems to be overcome in installing radios in fighting planes. There is little difficulty in installing a light radio in bombers and other large planes, but even the slightest change in weight on the single-seater pursuit plane is dangerous. An example of this is afforded by the recent test of a pursuit plane in which had been installed a weight equal to that of a radio set. At 10,000 feet the pilot put the ship into a spin and recovered after three turns. He then put it into a spin in the opposite direction, but after three turns was unable to bring it out. He tried every maneuver possible until he had lost 7,000 feet altitude and had to jump to save his life.

Attack aviation is another distinctly new development. Its specialty is the bombing of troops, anti-aircraft batteries, supply trains

These Flight Formations Illustrate Principles of New Attack Strategy

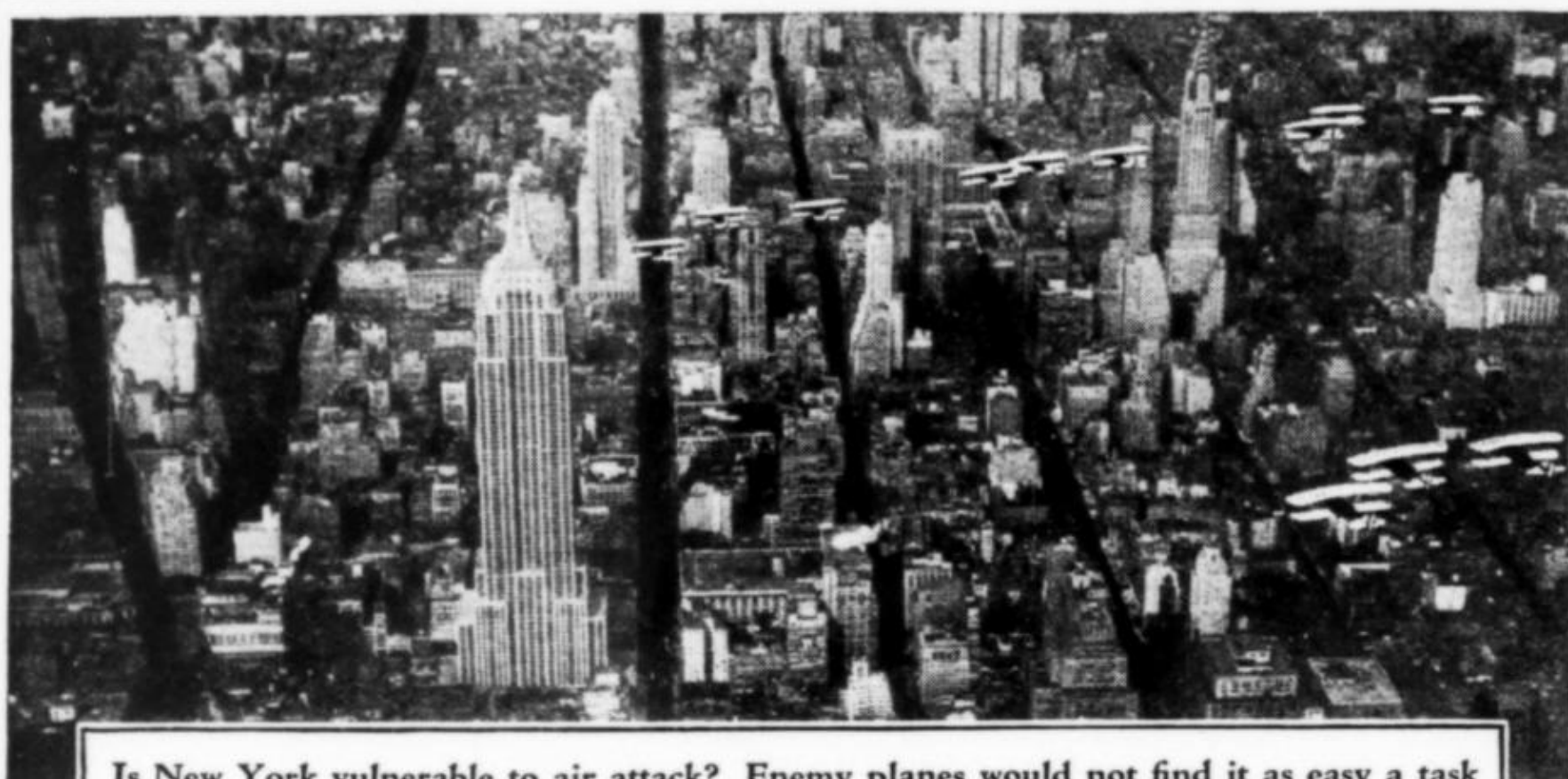


Above is an excellent photo showing the adaptation of formation flying to modern methods of aerial warfare. The large group of planes are bombers, twin-motored ships with heavy cargoes of explosives which do not fight except defensively. They are convoyed by fleet pursuit ships flying far above them, ready to pounce on enemy fighters and fend them off. Note that the close formation of the bombers leaves no lone ship sticking out to invite enemy attack. Bombing planes usually fly with their leaders at a higher altitude than the trailing planes, so that the machine guns of all ships can be brought to bear instantly on an enemy. Pursuit planes fly in formations like those illustrated at the right, ready to dive on the enemy. The leader of each three-plane element flies in front, and signals by dipping wings.

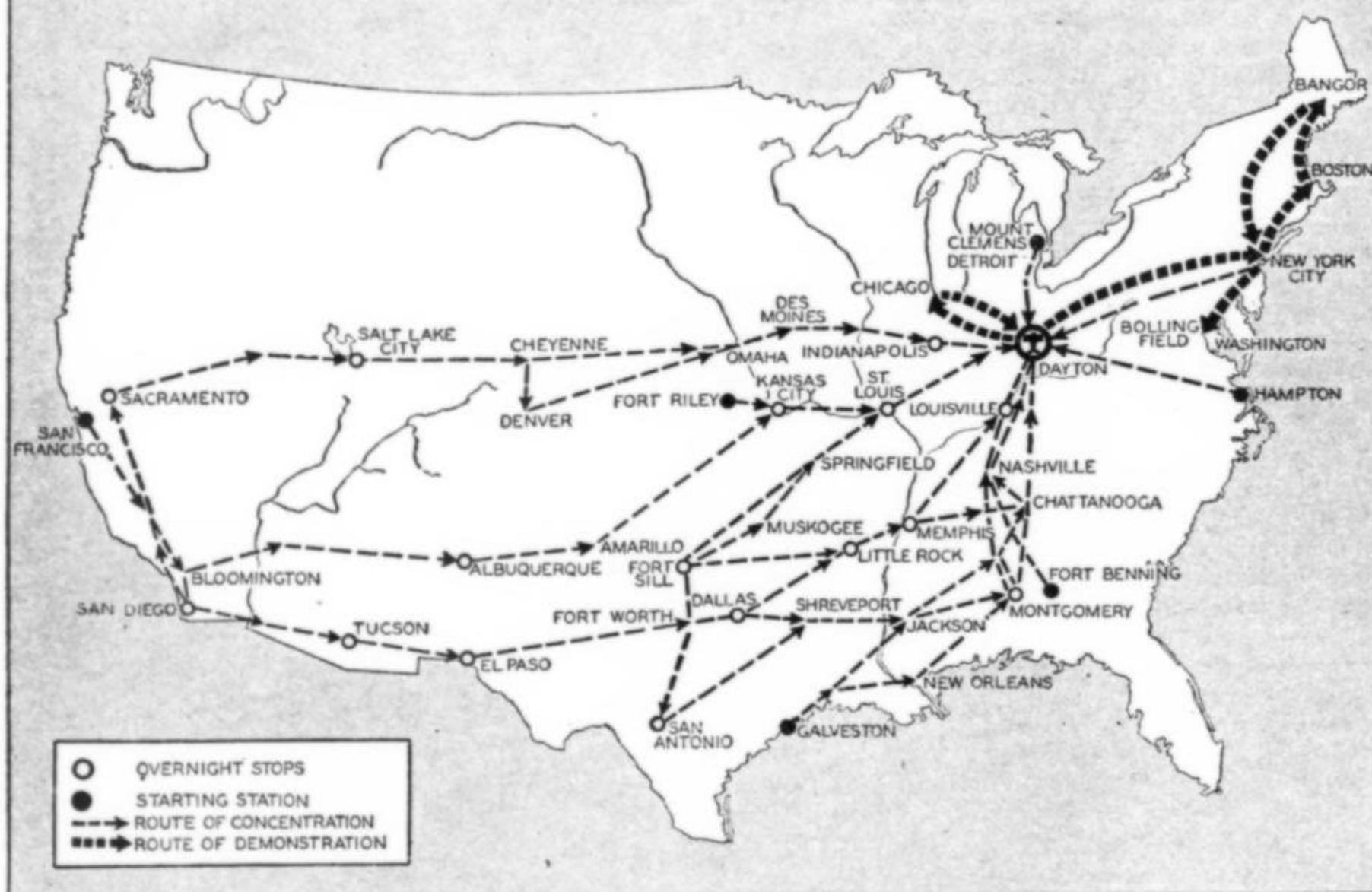


This photo shows a flight of bombers. In addition to pursuit planes flying above to protect them from enemy fighters, bombers are frequently escorted by attack planes flying below them at altitudes of 500 feet to drop bombs on the anti-aircraft batteries. The insert drawing shows the method of a three-plane element in making a turn. As illustrated, each plane travels approximately the same distance.

Anti-Aircraft Guns Are Effective Defense Against Planes Attacking City



Is New York vulnerable to air attack? Enemy planes would not find it as easy a task to destroy the city as some enthusiasts think. Anti-aircraft guns have been developed to such a remarkable degree of proficiency, aiming themselves automatically and getting their own range, that planes can now be brought down as easily as a hunter bags a duck.



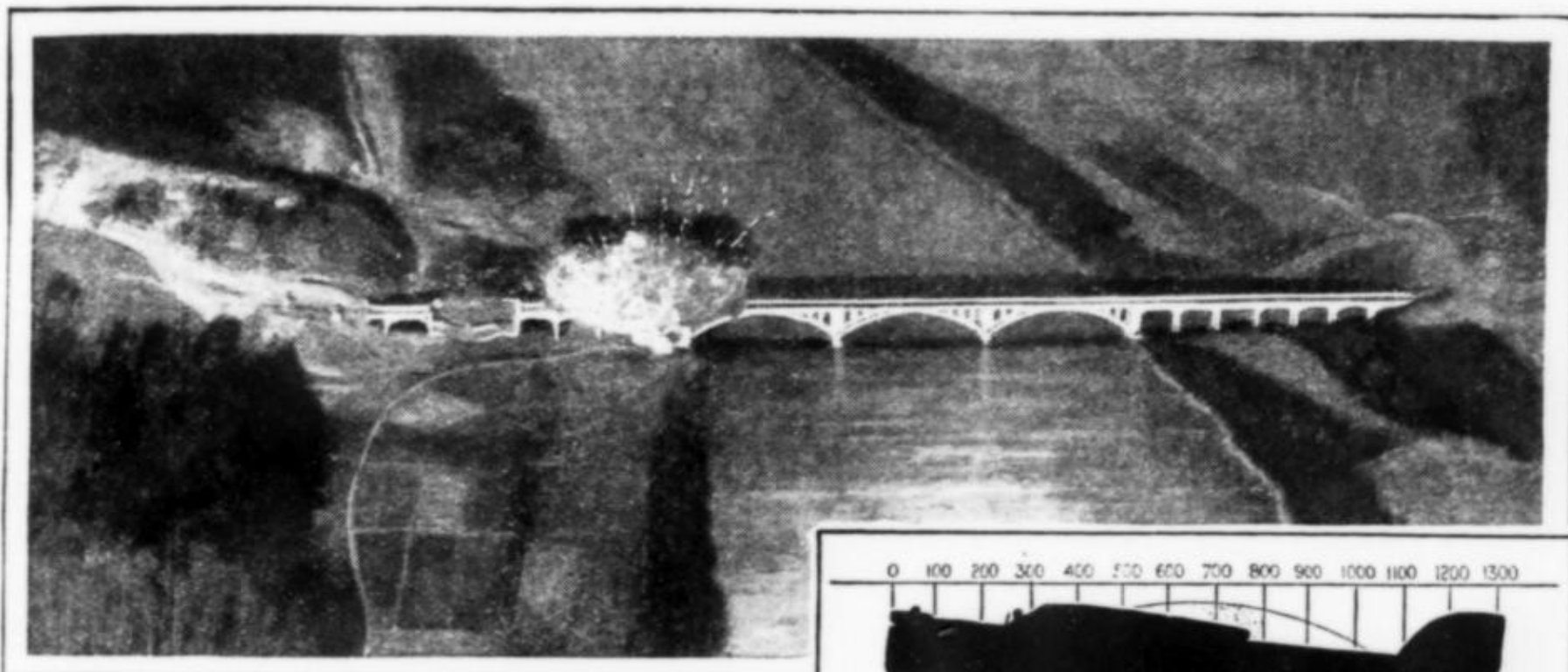
This map shows the route of assembly of the 672 planes of the First Air Division, which concentrated at Dayton, Ohio, and started from there on its tour of the country. With the return routes (not shown on the map) every city of importance in the country will have been visited by the vast air fleet.

and planes when on the ground. They approach their game hedge-hopping and tree-dodging, and drop their bombs and are away almost before the unfortunate target knows what is happening. They fly too low to be hit

by the 3-inch guns of the "Archies" and are in and out of machine gun range in less than a minute and may be in sight for only a few seconds.

An attack group with its hundred planes

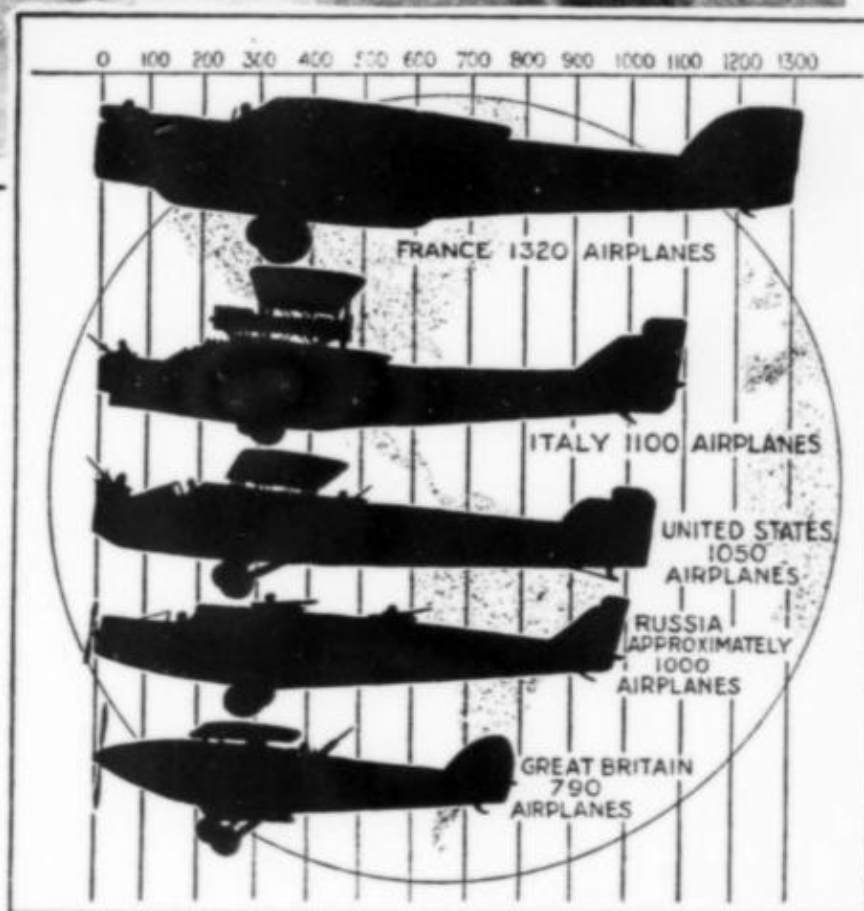
Modern Concrete Construction Is Surprisingly Resistant to Air Bombs



A 600-lb. air bomb dropped on this concrete bridge, slated for destruction, did comparatively little damage. It required an 1100-lb. bomb to demolish the section visible at the left of the explosion in the above photo.

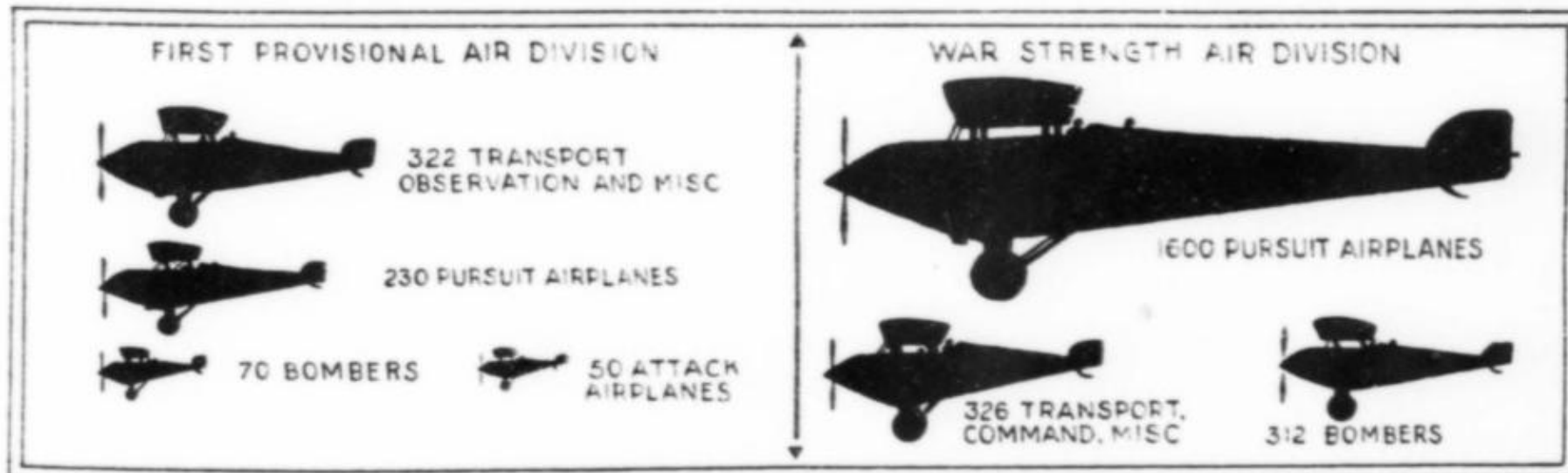
can bomb the entire fourteen-mile length of a division of troops, 20,000 men, in a minute and be on their way. To do this they would split up into three plane elements, as they approached the division, each element assigned to a definite portion of the division. All would dive on the column at the same moment with machine guns belching, straighten out, and fly along the heads of the troops dropping their bombs at intervals. The three planes of each element fly as one, the two rear planes guiding on the leader. Action is fast; the pilot must fly his plane, use his machine guns and drop his bombs all at the same time. The attack plane has four forward pointing machine guns and two defensive guns over the rear cockpit. It can carry three hundred pounds of bombs.

Attack aviation was unknown as a sep-



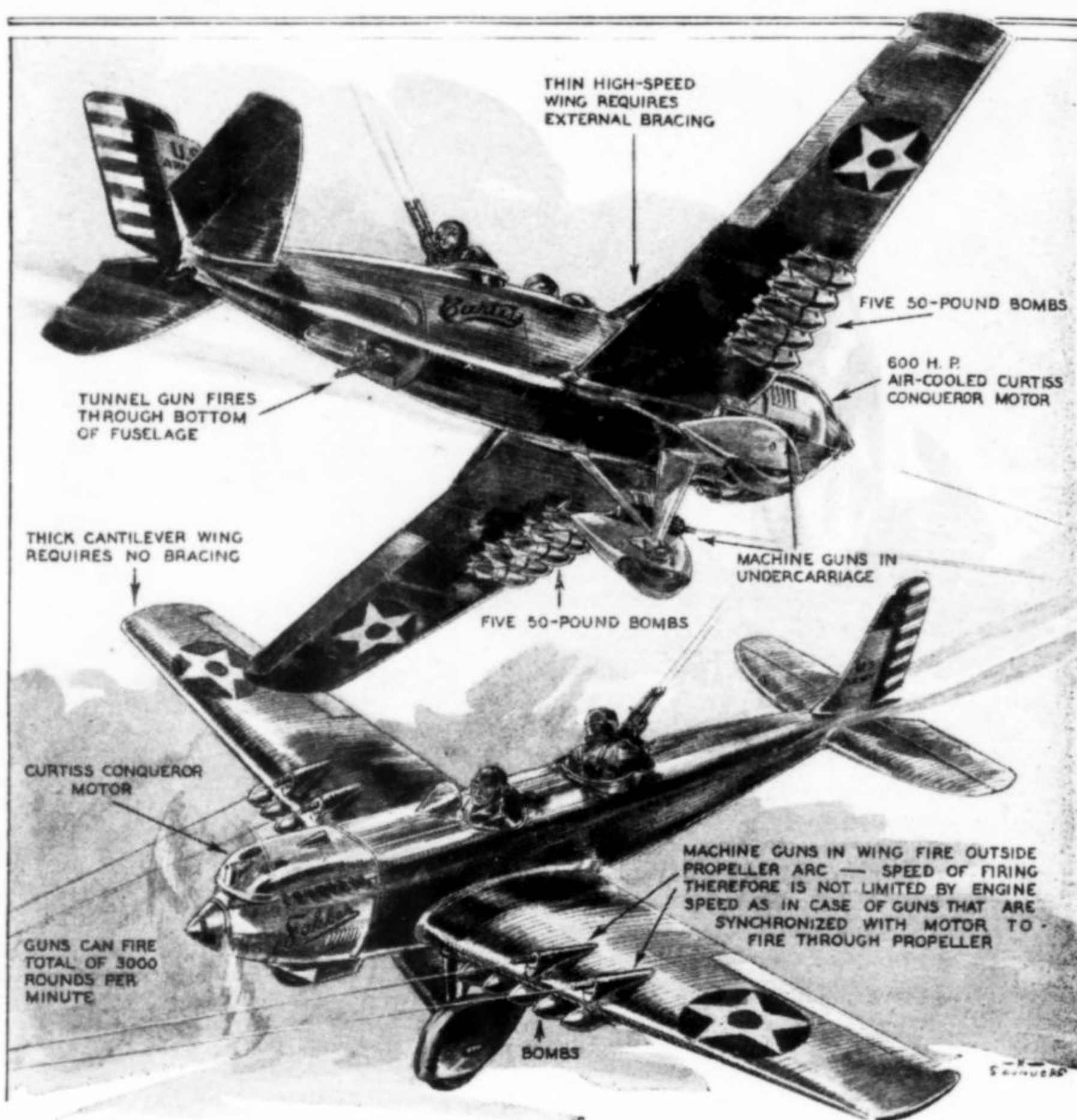
A graphic comparison of the air strengths of the great powers, as represented by the number of their planes, is presented above. The United States has approximately 1050 airplanes distributed among the Army, Navy, and Marine Corps.

arate type at the end of the World War, although the Germans had formed a couple of squadrons, shortly before the armistice, whose business was to operate as attack does



Compare the strength of the First Air Division—all the fighting planes the Army could muster—with the ideal strength of a war division. The war strength drawing shows no attack planes, which are considered as elements of ground warfare. The United States ranks third in number of airplanes.

Secret "Flying Tanks" Fire 3000 Shots Per Minute, Carry Ten Bombs



These drawings of two secret attack planes of all-metal construction now being built for the government are based on reliable information. No photographs are obtainable. If these flying tanks pass tests successfully, the Army will likely place a large order for them.

now. It developed from "ground strafing." Planes flying low over enemy troops found that they were rarely hit and they were able to drop their bombs from low altitudes with uncanny accuracy.

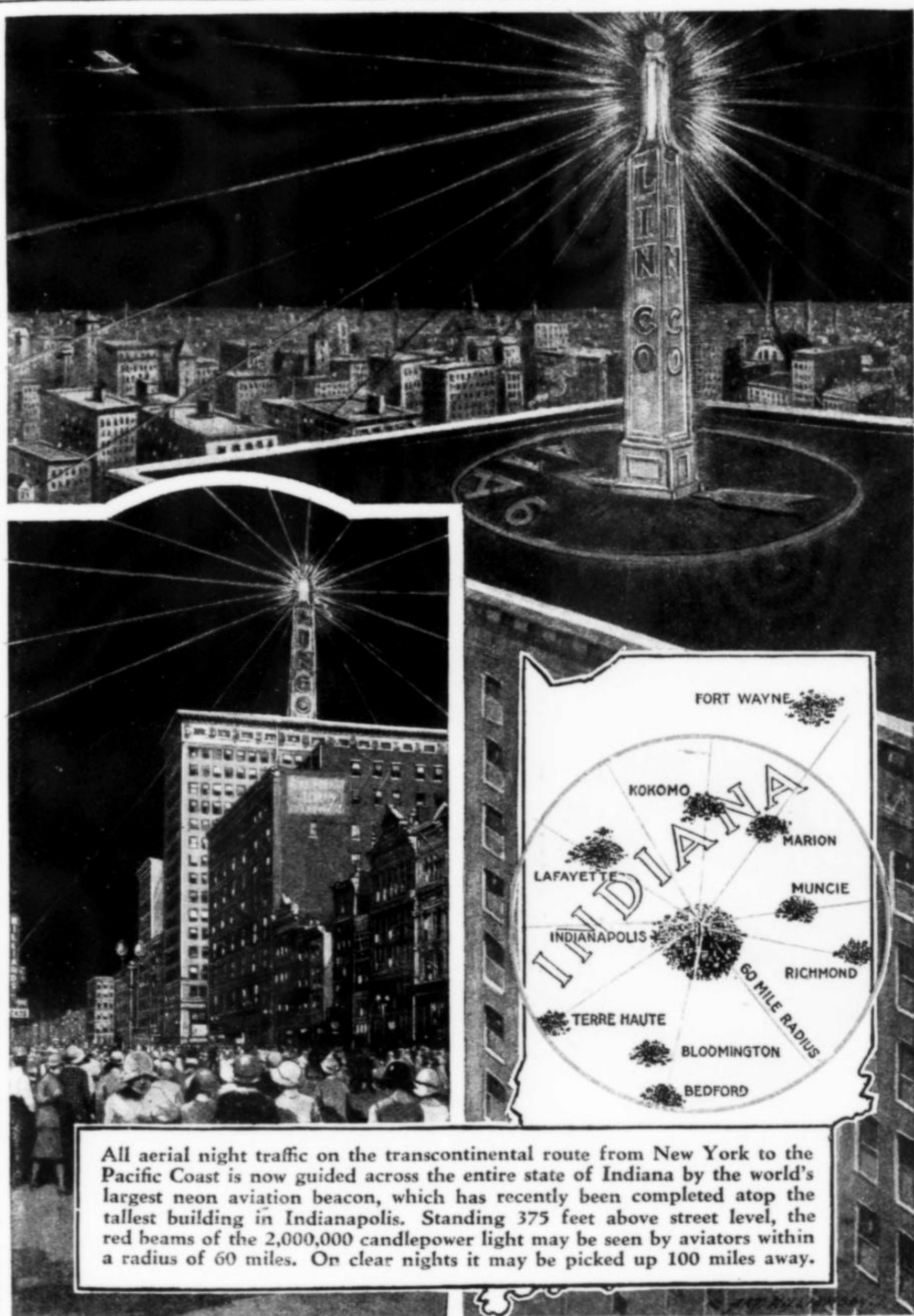
Attack, bombardment, observation, and pursuit are the four main types of planes used in modern warfare. Attack and observation planes are much the same as far as construction goes; each is a two-place ship with pilot and observer, carrying machine guns shooting forward through the propeller, and another gun or two at the rear to defend the tail. Observation planes usually fly alone

in time of war, being protected by pursuit planes if necessary. The purpose of an observation plane is to make photographs, report on the position of enemy artillery, and otherwise act as the eyes of the army.

Bombing planes are twin-motored, comparatively slow, and they fight only defensively. Pursuit planes flying above them act as an escort. Pursuit ships are single-seated, fast fighting units ready to fight at the drop of a hat. There are also transport planes for the carrying of troops. These are usually trimotored ships of large passenger capacity
(Continued on page 192)

Neon Beacon Has 120-Mile Range

Huge Light Is Visible to Aviators Across Entire State of Indiana



All aerial night traffic on the transcontinental route from New York to the Pacific Coast is now guided across the entire state of Indiana by the world's largest neon aviation beacon, which has recently been completed atop the tallest building in Indianapolis. Standing 375 feet above street level, the red beams of the 2,000,000 candlepower light may be seen by aviators within a radius of 60 miles. On clear nights it may be picked up 100 miles away.

MODERN MECHANIX

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AUGUST
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Powderless Gun Hurls Shells 100 Miles

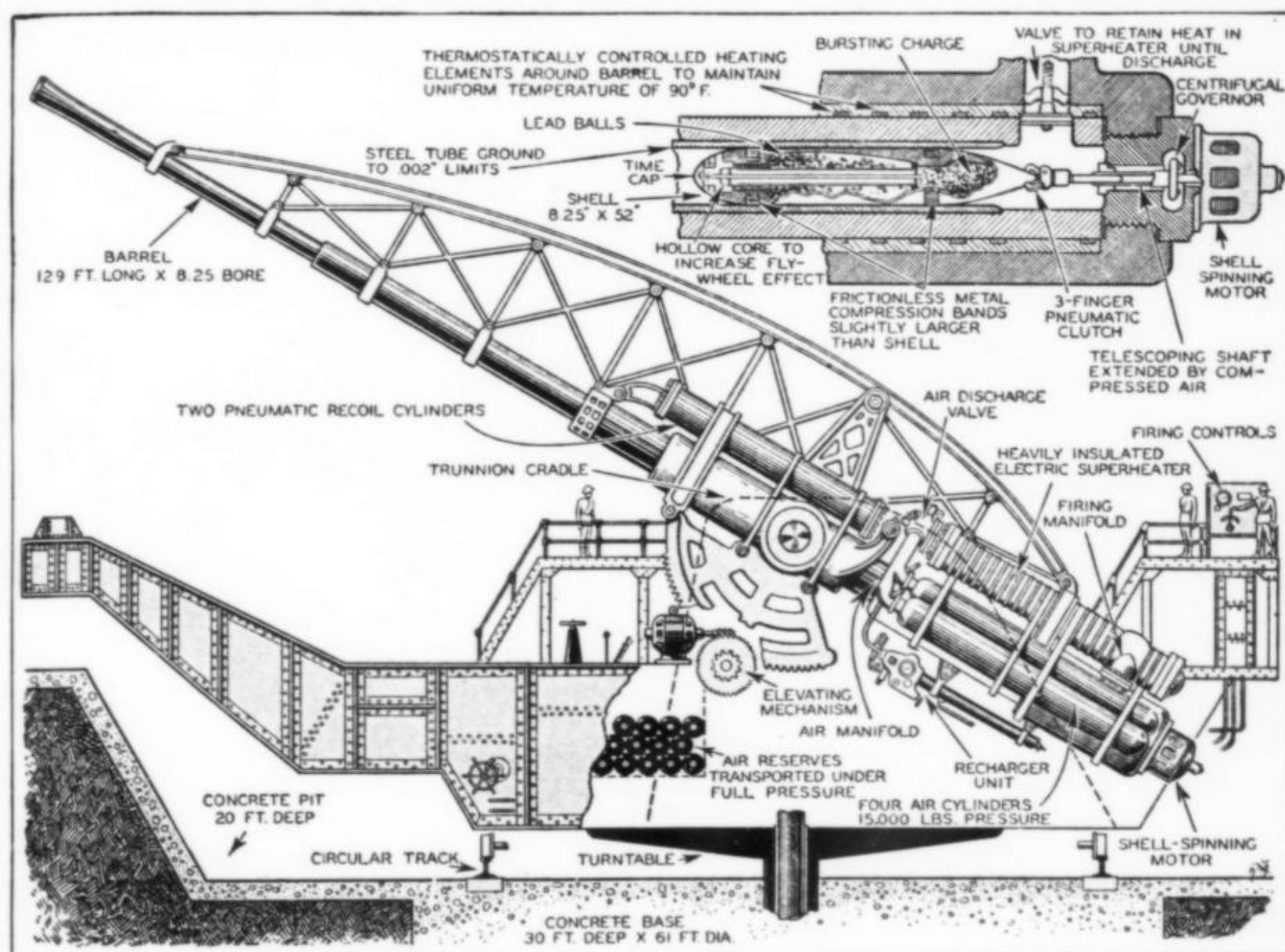
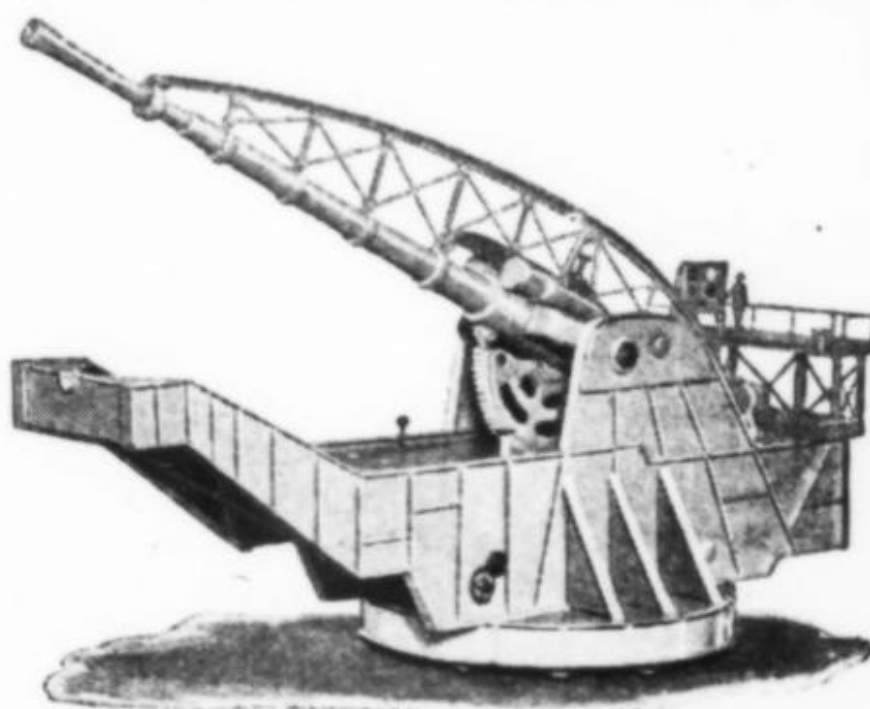


Diagram of proposed gigantic compressed air gun, with breach block detail at upper right. Bore is ground glass-smooth, and oiled before each shot. Four air cylinders are used for each shell. Huge proportions make permanent base necessary.

THE staggering cost and brief life of the World War Paris guns inspired Hi Sibley, a California inventor, to design a powderless long range gun. It is claimed the new gun will hurl perfectly streamlined projectiles to unprobed heights of the stratosphere. Missiles of destruction could be dropped on armies and hostile cities hundreds of miles away with deadly accuracy. The life of the German long range guns was but little more than one second, but the new pneumatic gun would last indefinitely.

There would be no need of wasting thousands of dollars in firing other guns each time the long range gun is fired, merely to conceal its position, as was done with the Paris gun. The compressed air gun would make a report but little louder than that of light artillery.

Frictionless-metal compression bands on the shells fit to within thousandths of an inch into the glass-smooth barrel of the pneumatic gun. Just before firing, the shell, supported on ball bearings inside the compression bands, is started spinning by a high speed electric motor. A clutch on the drive shaft projecting through the breech block grips the tail of the shell, but releases

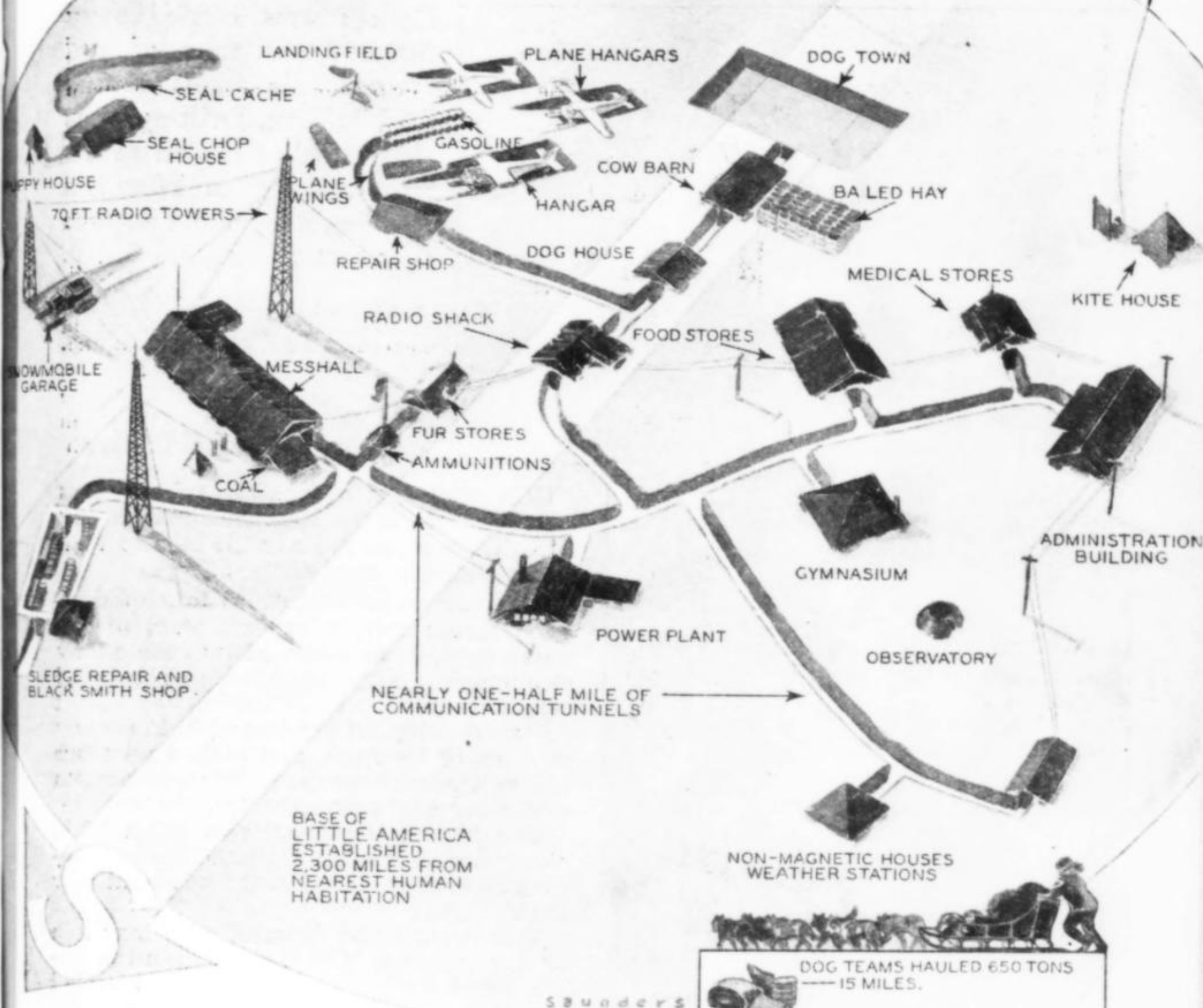


Photograph of one of latest models of compressed air guns, with every bit of mechanism accurately reproduced to scale. Elevating and turning mechanisms are electrically operated.

automatically when the compressed air charge is turned on.

Even though clearance between shell and barrel is less than that between piston and cylinder in a steam engine, there is very little wear on the barrel. Before each shot the barrel is lubricated with a specially designed atomizer spray which travels the entire length of the gun barrel.

Byrd's Ice Tunnel Village in Antarctica



WHILE America swelters in the grip of summer heat waves, Little America, at the other end of the globe, is braving the icy rigors of an antarctic winter night which is four months long.

As shown in the graphic illustration above, only by means of narrow ice tunnels beneath the snow can communication be kept open in Admiral Byrd's South Pole village. Nearly half a mile of these tunnels connect buildings buried to the roof tops.

Fifty-six men live and work in this ice-bound community, snug and warm in their polar dugouts. The community has a power and light plant, radio equipment, movies, repair shops, a library, complete medical and scientific apparatus, a four-cow dairy and a dog-town comprising 122 huskies and 7 pups.

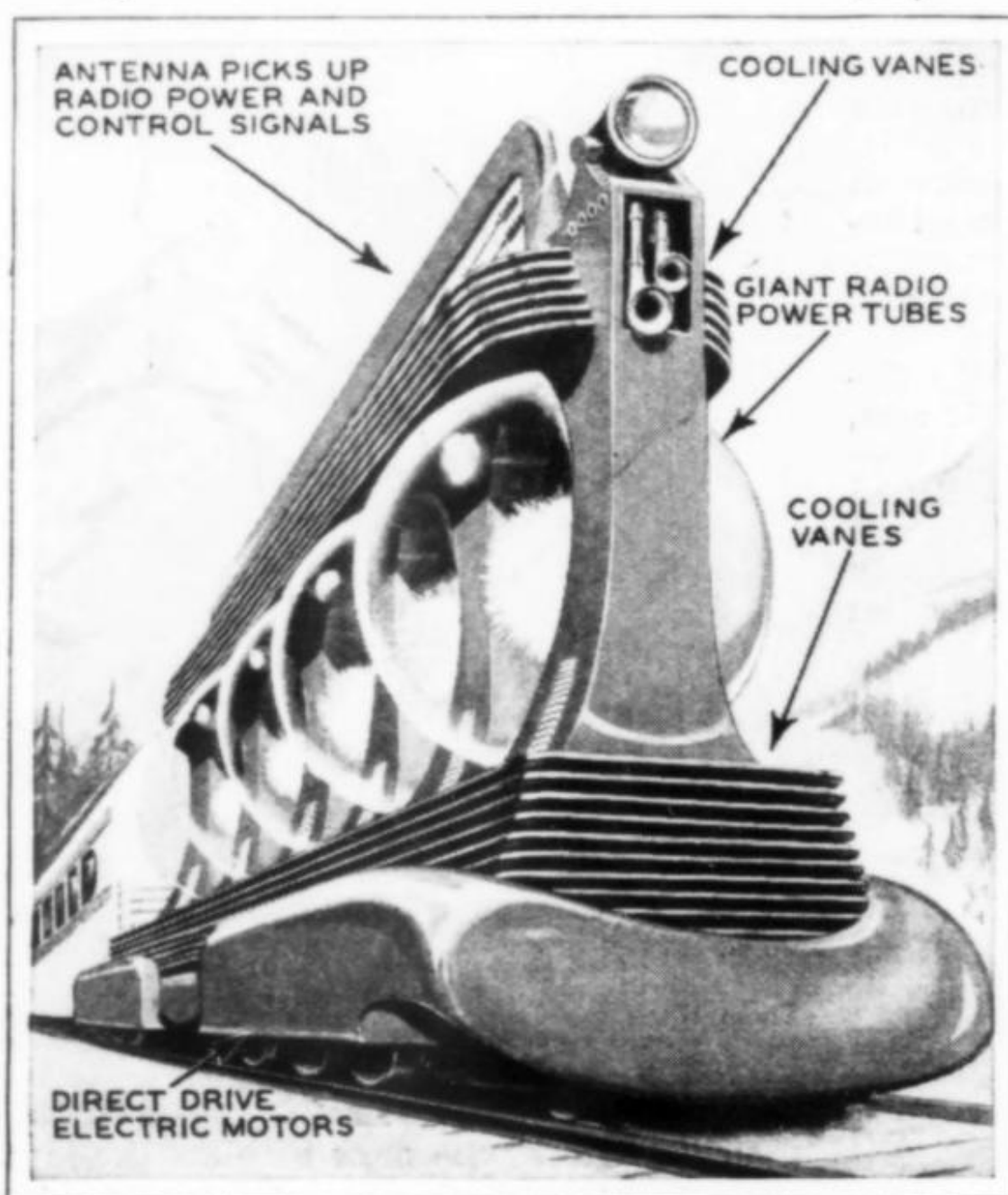
In addition to the regular working crew, a staff of scientists is studying the cosmic ray bombardment, the flight of meteors, thickness of the ice sheet and microscopic life in the Bay of Whales.

NON-MAGNETIC HOUSES
WEATHER STATIONS

DOG TEAMS HAULED 650 TONS
— 15 MILES.

CURED & FRESH MEAT	13 TONS
CORNERD & SALT MEAT	12 TONS
CHICKEN & TURKEY	1 1/2 TONS
EGGS 500 CASES	
BUTTER & LARD	3 TONS
FLOUR	15 TONS
COFFEE & TEA	3 TONS
COAL	75 TONS
HYDRATED FRUIT	4 TONS
AVIATION GASOLINE	10,000 GALS.

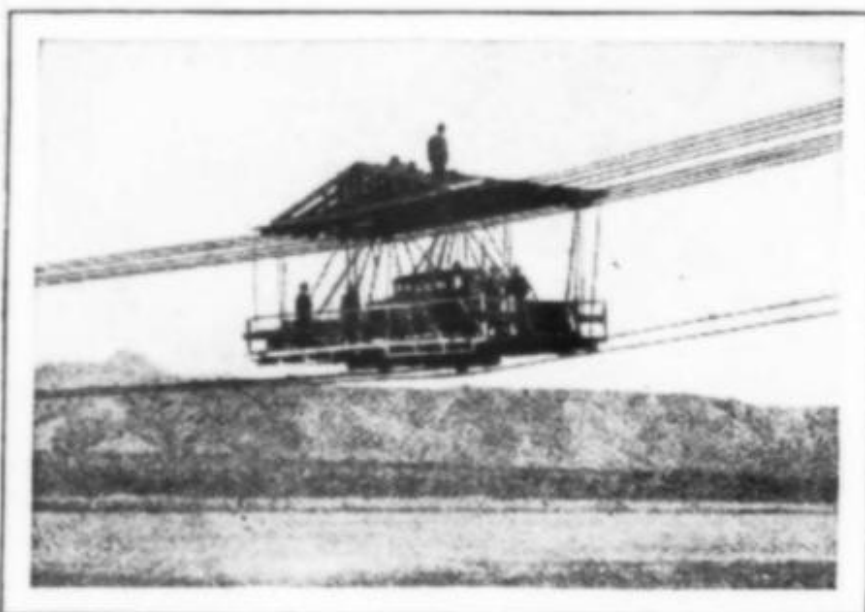
Radio Tube Train Gets Power from Air



This design for a radio powered train was suggested by an electrical engineer. Radio impulses would supply power and control train eliminating necessity of a pilot.

Aerial Ferry Carries Automobiles

SPANNING the Colorado River near Searchlight, Nev., is the only aerial ferry in the world for transporting automobiles. Forty miles down river from Boulder Dam, the ferry completes a short cut between Kingman, Ariz., and Boulder City. A 25 h.p. gasoline engine is mounted on the upper deck where the operator rides. The ferry carries three tons and makes the 640-foot trip across the river in 2½ minutes.



Eight cables above and two below support this aerial automobile ferry. A gas engine on upper deck operates it.

TRANSMISSION of power by radio will result in some radical changes in industry, especially in the field of transportation.

Recent experiments with railroad handcars run by radio suggested the design for a radio tube locomotive shown on the left. The electrical engineer who conceived the unusual power plant claims that such a locomotive could be controlled without a pilot.

The body of the locomotive would be surmounted by a series of huge radio rectifier and receiving tubes. The gigantic tubes could be built of unbreakable glass. Vanes running the full length of the car above and below the tubes will radiate excess heat and prevent the red hot electrodes from melting.

Electrical power impulses from a hydro-electric generating plant would be picked up by the antenna, rectified, and transmitted to the motors. Radio impulses could also control the train.

Outboard Bike Used in Water Polo



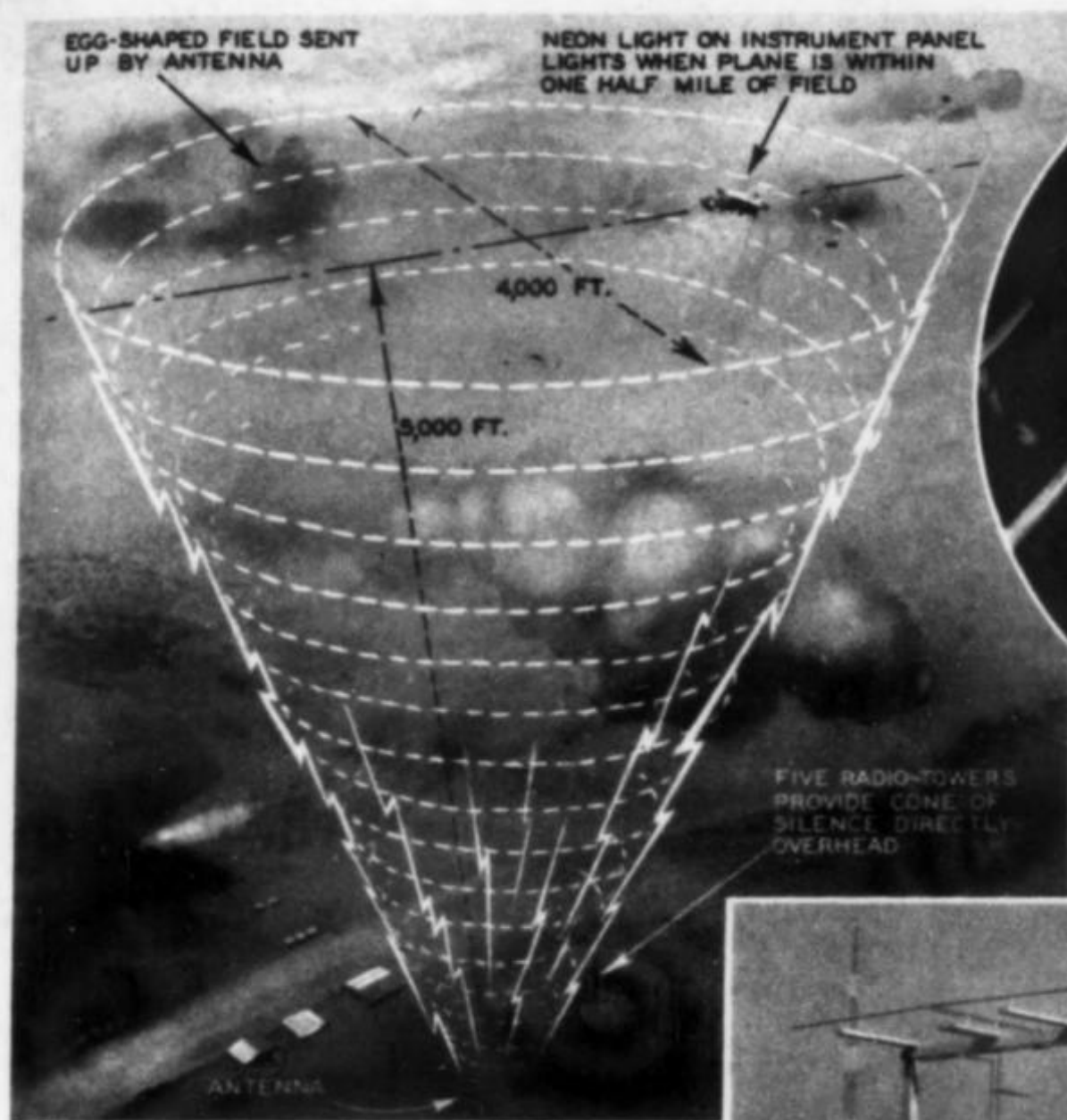
This water steed develops 18 to 25 miles an hour and is controlled by one hand. It was designed for water polo.

A SEA-GOING mount has been designed for the exciting sport of water polo. The boat is controlled by the player's left hand so that the right is free to swing the mallet.

The rider sits comfortably in a motorcycle saddle and controls the speed and direction with a special motorcycle hand grip on the steering bar. The boat has a speed of 18 to 25 miles an hour. The hull is a watertight pontoon, with a rubber bumper all around it. The boat is propelled by an outboard motor.

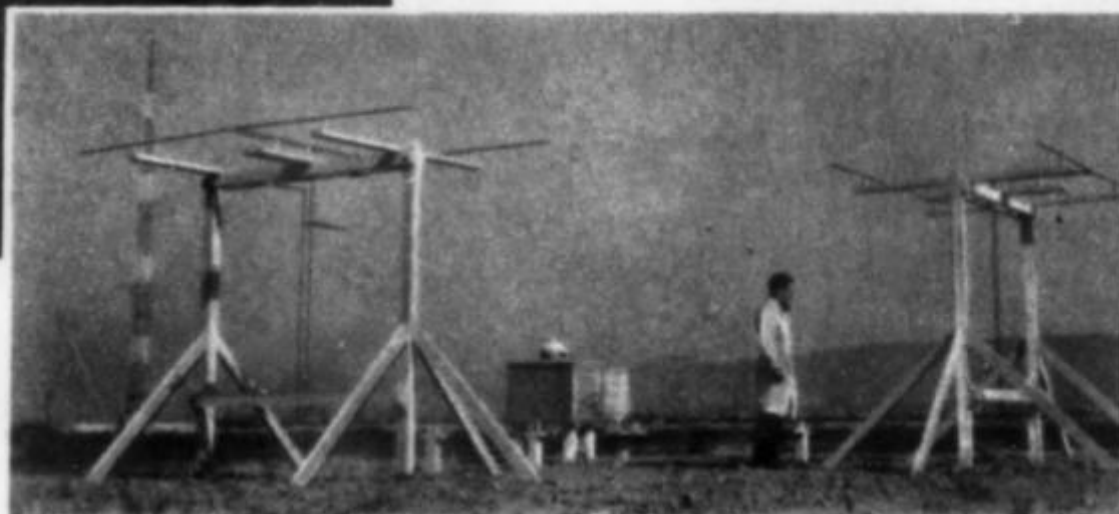
Modern Mechanix and

Radio "Cone Of Silence" Directs Fliers To Airport



View of pilot's cockpit showing the neon lamp that flashes when plane passes through "cone of silence," indicating airport below.

Above—New radio device sends up a "cone of silence" that lights a neon lamp in pilot's cockpit, indicating that airport is below. Right—View of the special type antennas used. They can send up a cone that will reach an altitude of 12,000 feet.



THE newest radio aid to aerial navigation creates a "cone of silence" that lights up a neon lamp in the pilot's cockpit as his airplane passes over a clear, or fog covered field. The lamp actually lights when the airplane is a half-mile from the cone of silence, and remains lighted until the airplane has left the station a half-mile behind.

This new device, in use at the Boeing School of Aeronautics, requires only two small aerials placed alongside five mast-type antennas that send out directional beams, a 5-foot aerial extending along the plane's fuselage, and a lightweight high frequency receiver weighing 6¼ pounds.

Tests show that the cone-shaped field cast upward by the two aerials reaches a height of 12,000 feet. At an altitude of 5,000 feet, the cone is 4,000 feet wide. When the flashing neon lamp indicates that the plane is over the field, the pilot swings about, prepares to pick up the regular radio landing beams sent out by the large antennas, and lands. This "cone of silence" device will be particularly valuable when the airport is hidden by fog.

Inventions, October, 1936

Bike Grips Made Of Molded Bakelite

BAKELITE molded handlebar grips are aiding the bicycle's return to popularity. The molded grips are unaffected by perspiration from the hands and can be permanently fastened through a patented construction.

The new type grips appear in a variety of colors that do not wear off, contributing to the beauty of the bicycle. They can be fastened to the handlebar without the use of glue or other adhesives. Manufacturers have been quick to see the advantages of the molded grips and are placing them on their new models as standard equipment. Colored grips attract the numerous ladies who are taking up cycling.



Perspiration proof, these bakelite molded handlebar grips are finished in many bright colors.

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NEXT MONTH



Wesley Sherwood Bessell, veteran New York architect, will begin a series of Model Home articles in the November issue of MM. He will cover every detail of site purchase, FHA finance, choice of materials. Two homes will be described, one that can be built for \$3,500 and the other for \$5,500. If you are interested in home building you cannot afford to miss these articles.

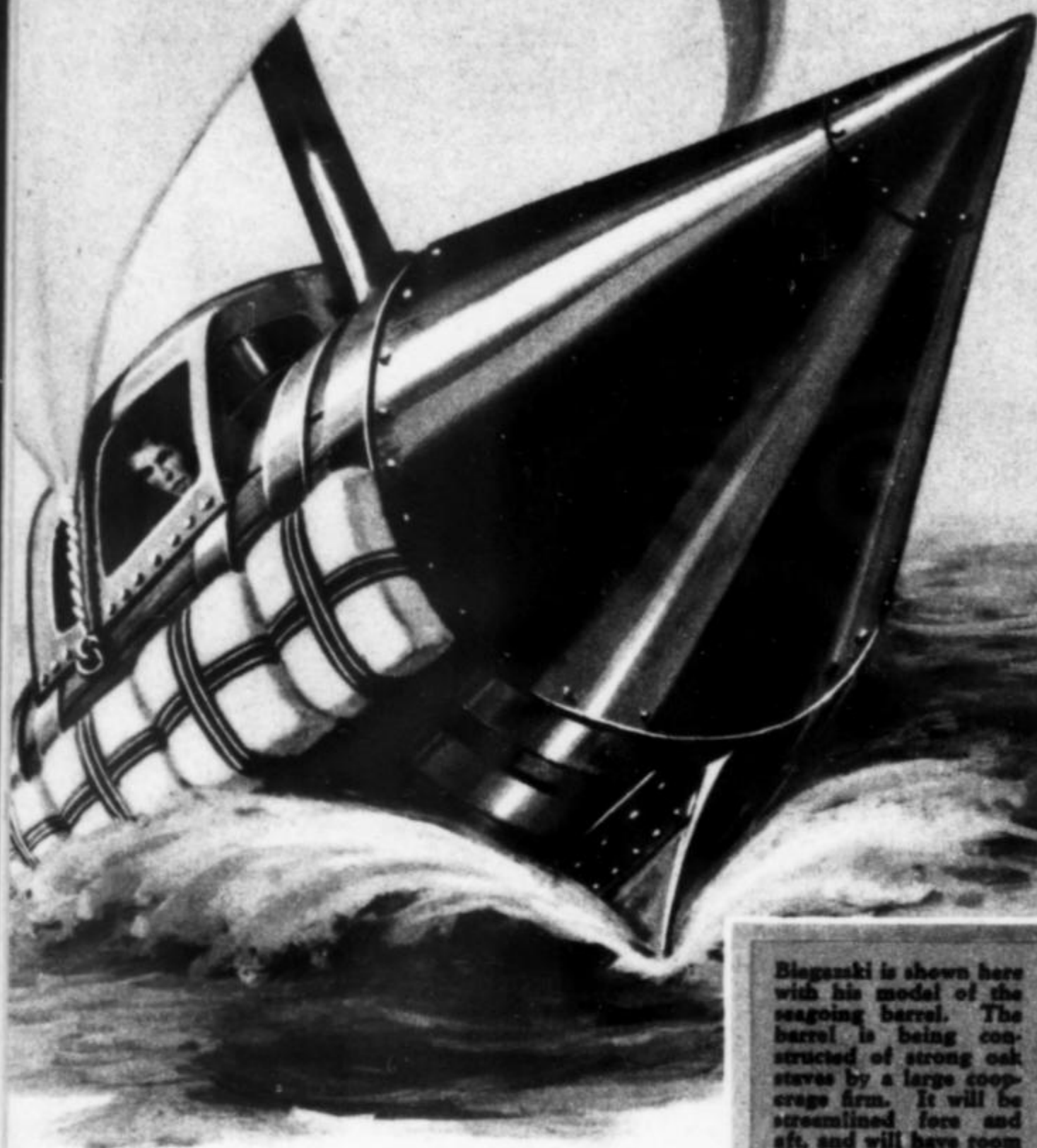
FOR WORKSHOP FANS

The How-To-Build section of MM for November will include plans for making of an Oscillograph, X-Ray apparatus, New Tricks in Magic, several wood-working items and lathe projects, Chemical Experiments, How To Set Up a Workshop and many useful kinks plus the first installment on building an authentic model of the Mayflower.

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Veteran Dares Atlantic In Barrel Boat

The Atlantic Ocean, conquered by scores of odd ships, is now challenged by nothing less than a barrel. Ernest Biegazski is the daring navigator who plans to use this means of battling the elements. When completed, the streamlined barrel will appear as at left.



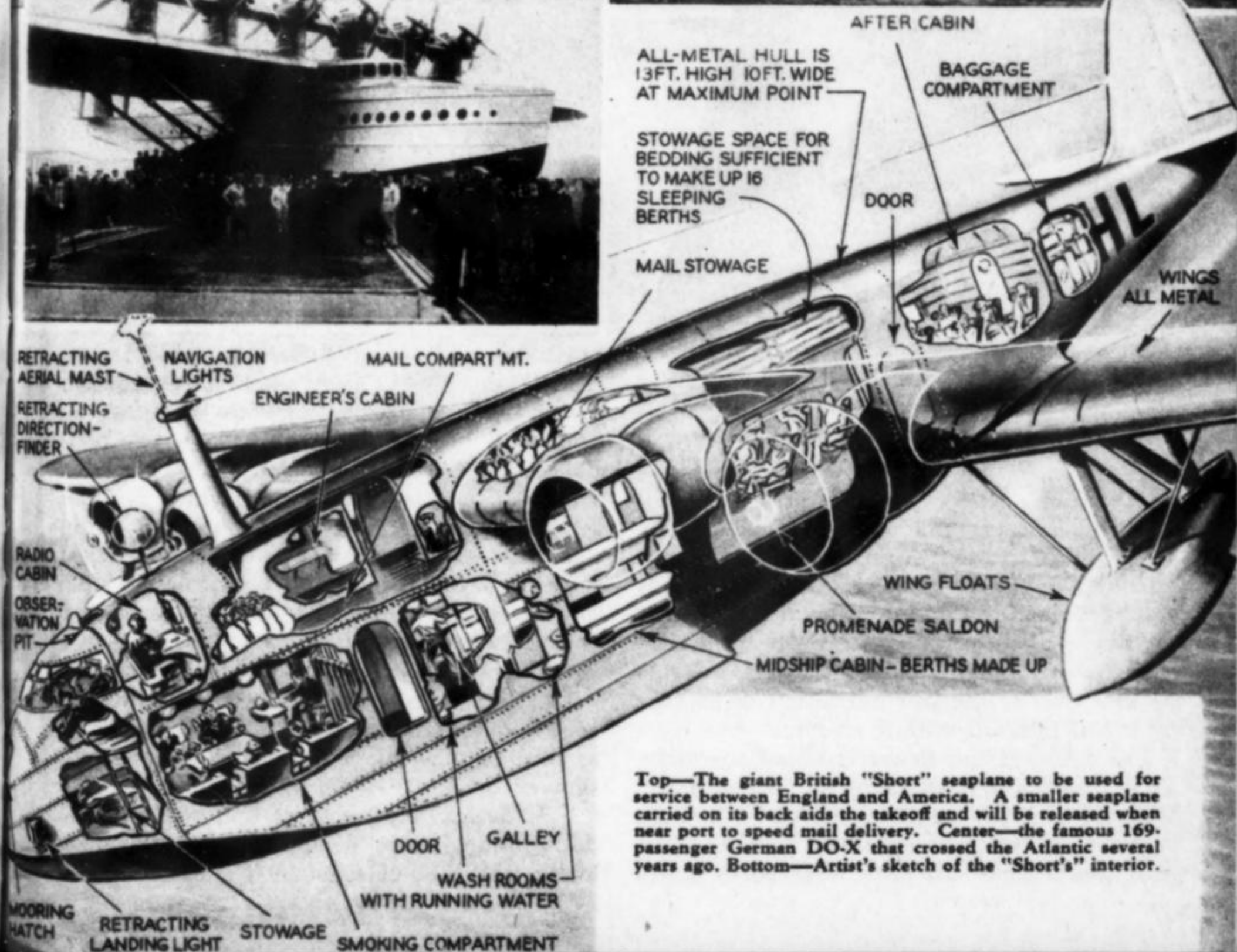
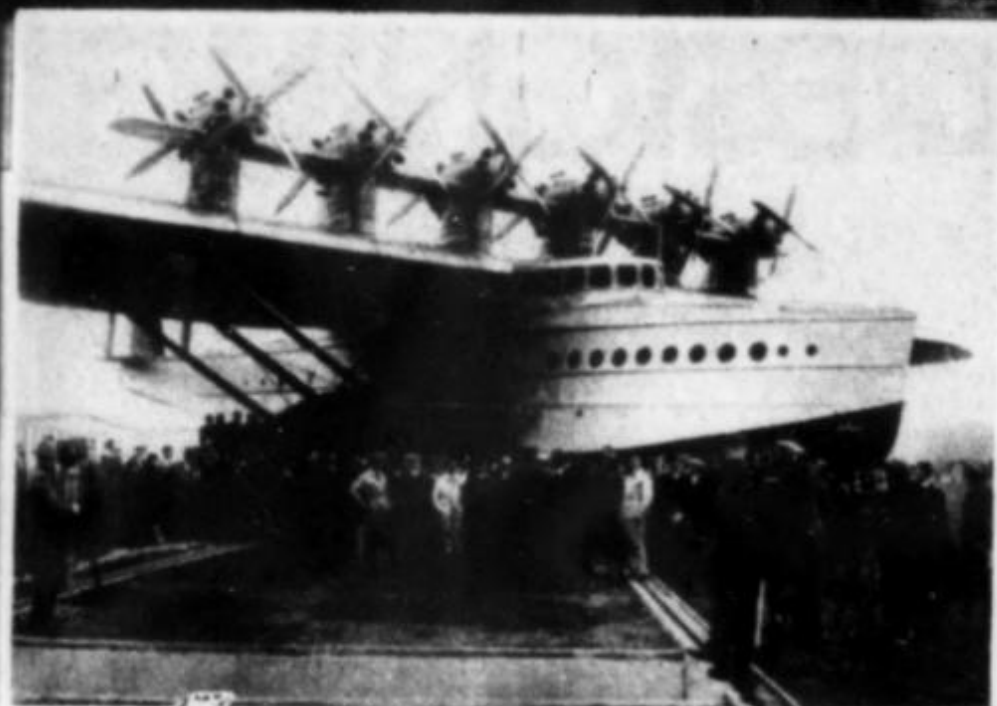
A SEA-GOING barrel—it sounds fantastic, but not to Ernest Biegazski, Buffalo, N. Y., war veteran, who plans to use just such a vessel to cross the Atlantic. The daring trip, according to his calculations, will not take more than 40 days. The oak barrel, which will comprise the hull of the vessel, will be nine feet long with a diameter of six feet, eight inches. A 600-pound keel will furnish the ballast. A hollow mast, 20 feet high, will carry the sail, a simple rig of approximately 300 square feet. A glass-enclosed hatch which will provide exit to the narrow deck. During stormy weather he will reef his sail, seal the hatch, and bob about safe as a cork.

Though the crossing is expected to take 40 days, Biegazski is taking food for sixty.

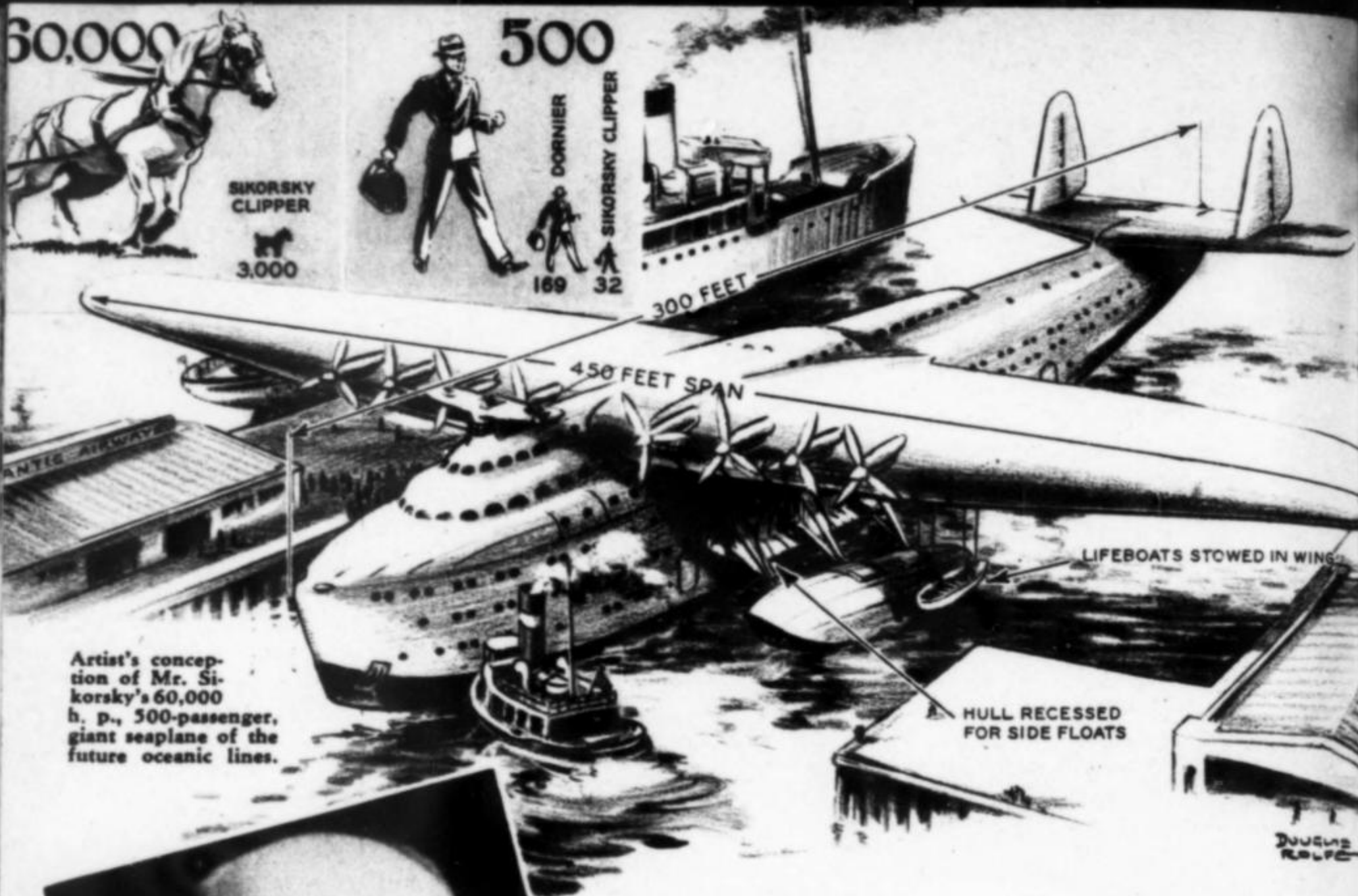
Biegazski is shown here with his model of the seagoing barrel. The barrel is being constructed of strong oak staves by a large cooperage firm. It will be streamlined fore and aft, and will have room in the hold for provisions and water for sixty days. Biegazski plans on crossing in forty days or less time.



GIANT PLANES for Atlantic Lines



Top—The giant British "Short" seaplane to be used for service between England and America. A smaller seaplane carried on its back aids the takeoff and will be released when near port to speed mail delivery. Center—the famous 169-passenger German DO-X that crossed the Atlantic several years ago. Bottom—Artist's sketch of the "Short's" interior.



Artist's conception of Mr. Sikorsky's 60,000 h. p., 500-passenger, giant seaplane of the future oceanic lines.



Igor Sikorsky, the famous designer of the Pan-American Clipper plane.

DESIGNING

by IGOR SIKORSKY,
Noted Seaplane Designer,

LET us suppose that at six o'clock in the evening in New York City you suddenly discovered that a vital engagement demands your presence in London at noon the following day. Upon entering the office of Trans-Atlantic Airways, the ticket agent informs us that one of the 500 ton liners of the air fleet will take off within an hour.

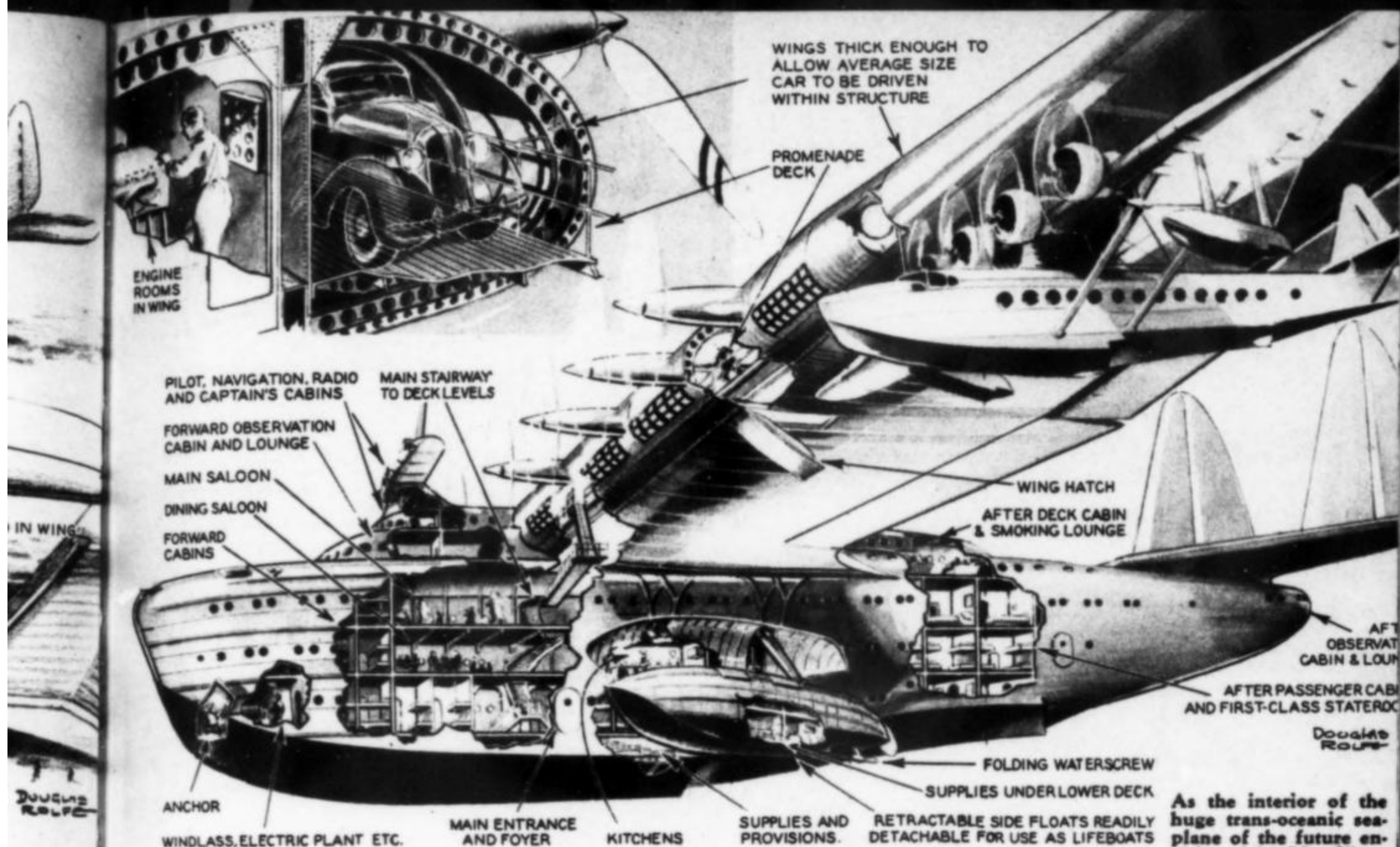
The price of the ticket is about the same as a first-class passage on an ocean liner. Will the gigantic seaplane get us in London in time for your appointment? The agent produces a timetable which reassures us on

that point. The company maintains a 16-hour schedule, day in and day out.

We board the luxury air liner in the harbor. Our first impression is that the seaplane is an ocean liner to which a huge wing has been added. The vast hull has several rows of portholes indicating different deck levels. The single wing is very thick, large enough for an average sized automobile to be driven within it. Along its leading edge are propellers driven by unseen motors. There are windows in the wing behind which we can see some of our fellow passengers strolling along the promenade deck. To support that huge hull the wing must be strong indeed, for the craft weighs 500 tons fully loaded when ready to fly.

The seaplane is crowded to capacity—500 passengers, with a crew of 100. We go to our cabin which is spacious, with a full size bed, several articles of furniture, and a private shower bath.

The dinner gong sounds and we find the dining room on the deck above, looking very much like that of a modern surface vessel.



As the interior of the huge trans-oceanic seaplane of the future envisioned by Mr. Sikorsky appears to the artist. A present day "Clipper" is shown for all-around comparison.

New MONSTERS

As Told To
DONALD G. COOLEY

of The AIR

Finishing dinner, we stroll through wide corridors to the smoking lounge. On the way we pass the main salon where couples are dancing to the music of an orchestra. We pass through the bar and pause for refreshments, and then hurry to the promenade deck to see the seaplane take off.

Can this be the interior of an airplane wing—this vast corridor extending ahead of us, crowded with passengers chatting, walking, or looking out of the windows of the leading edge? We watch the seaplane's wake as we take off.

Is this, you may be wondering, some Jules Verne fantasy I am attempting to create for you? Quite the contrary. It is a sober picture of the trans-oceanic seaplane of the future as I envision it. True, it will be a generation, perhaps two, before the 500 ton seaplane becomes a reality, but it is on its way.

The Pan-American Sikorsky "Clipper" which has blazed an air route between San Francisco and the Orient, making trans-Pacific air service a present day reality,

weighs 20 tons. Yet even the "Clipper" must be regarded as only a promise of what is to come.

As I discuss this topic with the writer of this article, I have on my desk the plans for a four-motored seaplane capable of carrying 35 passengers and a crew of 11 for 4,500 miles. Within three or four years, I believe this 50-ton seaplane will be in regular trans-oceanic service. Inside of a few years it will be possible to fly around the world in about ten days on established air lines. Engineers have learned that *there seems to be no practical limit in sight to the size of a seaplane.*

Considerations of economy and safety make the super-seaplane inevitable. Although a large plane will be inherently safer than a small one, the super-seaplane will carry an expert crew who will pilot it with the same specialized skill as the officers of an ocean liner. In the extremely remote event of a forced landing, a 500-ton seaplane hull could ride out of a very severe gale. Radio reports will enable the captain on an air liner to set a course to avoid storms en route.

1912



It is the amazing destiny of the seaplane to shrink the boundaries of the world to the ultimate degree. Future air liners to Europe will eventually operate on a 16-hour basis. The seaplane brings nations so close together that it is not too much to predict that it will force the recasting of international relations in an entirely new mold.

What will the super air liner of tomorrow look like? In its essentials, it will be very much the same in appearance as seaplanes of today, except for size. The air liner will have a single huge cantilever wing. The seaplane of tomorrow will be built out of new and stronger alloys.

What does the super-seaplane mean when reduced to terms of military strategy? It will force a complete revision of traditional methods of warfare. Today, the small military plane is giving away to the large ship, and the pursuit plane is rapidly becoming of secondary importance. The huge modern bomber capable of 290 miles per hour domi-



Igor Sikorsky was a pioneer constructor of huge land and sea aircraft. Top—One of Sikorsky's early "giant" planes. At Right—A Sikorsky S-38 Center—A Pan-American "Clipper" built by the famous designer. Lower Right—Interior view of an S-42 "Clipper" plane.

Horsepower increases proportionately to the size of an airplane; consequently, the large craft that we depict here will require mighty engines delivering some 60,000 horsepower. The instruments which are sure to come—devices for blind landing and the like—cost no more in a large vessel. And the large plane requires a smaller crew, proportionately to the payload carried, than the small ship.

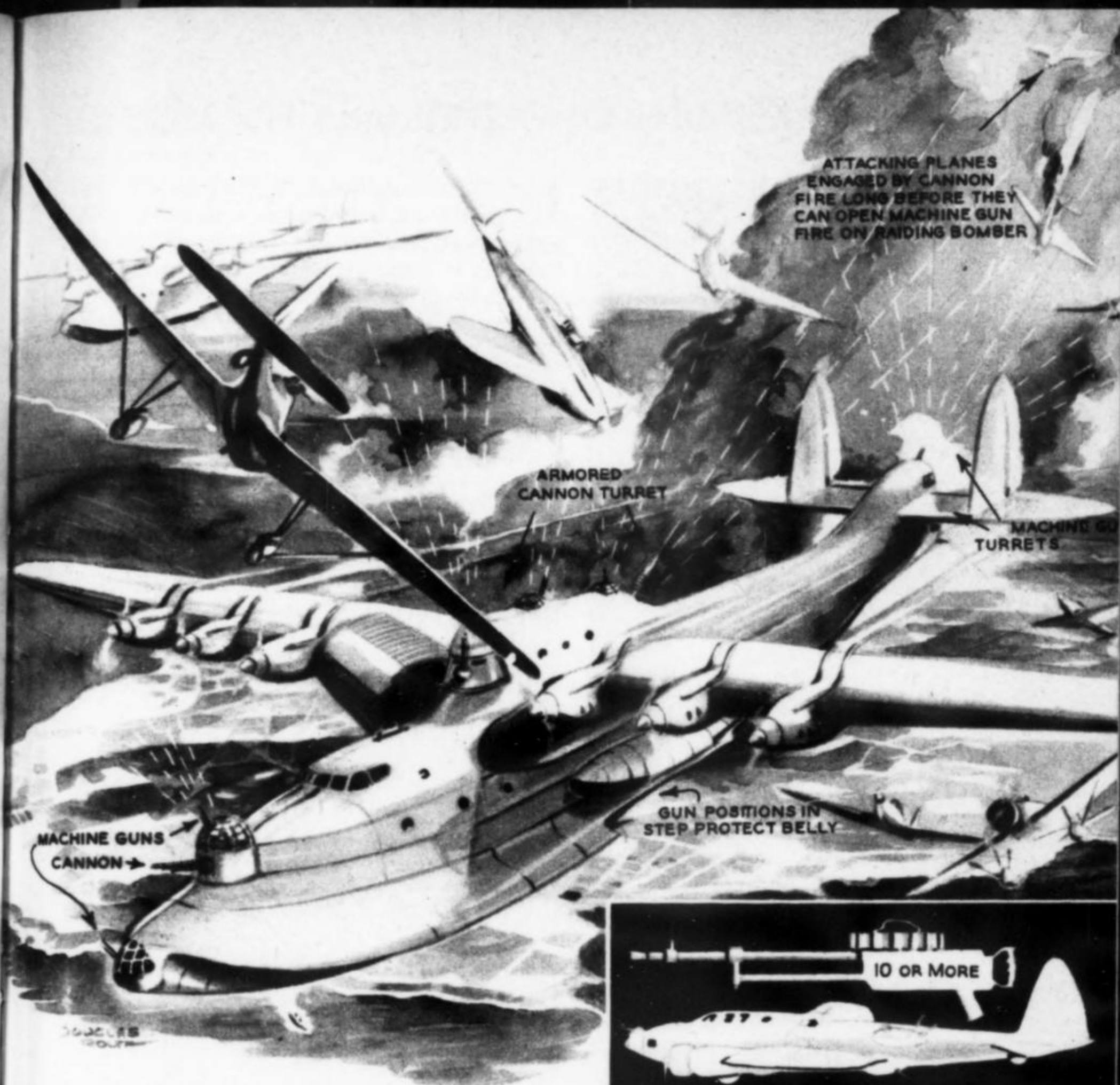
It is essential that the air traveler be offered comforts similar to what he is accustomed to on a luxury liner—large cabin, spacious salons, wide corridors, and promenade decks from which he can watch the inspiring vista of clouds and water.



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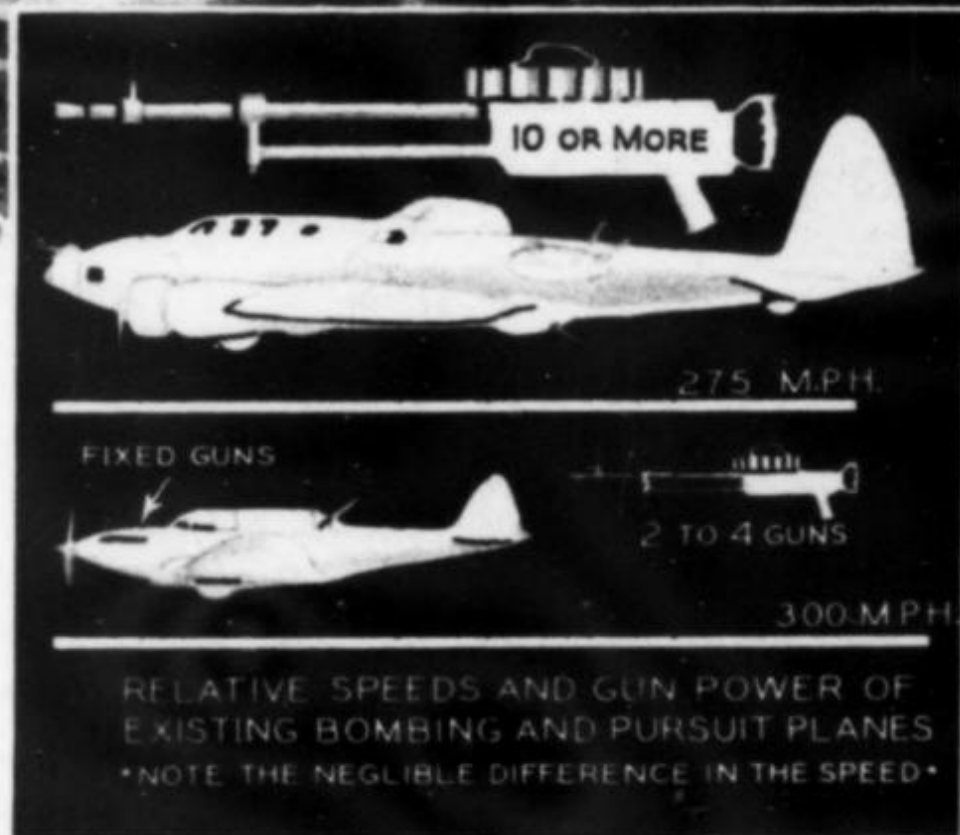
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Future air bombers are envisioned as veritable "flying forts" by Mr. Sikorsky. They will be armored and manned by large crews. Small cannons and many machine guns will make their armament superior to that of the fast attack planes.

nates the picture. The small attack plane must exceed the bomber in the power of its armament. As this is not possible in a small plane, a large, fast, attack cruiser with a large number of guns will be the only real adversary for the huge bomber.

The air force is developing into a navy of the sky, the planes functioning like the battle-ships of a fleet. They will be huge, fast, in



some cases armored, and will carry a large crew of gunners and officers.

It is possible to build a bombing plane which could make the round trip from Europe to New York. I am not an alarmist and do not wish to be misunderstood. I speak only as an airplane designer, and from that point of view I wish merely to affirm that such bombers could be, and some day undoubtedly

[Continued on page 147]



MECHANIX

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THE HOW-TO-DO MAGAZINE

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JAN 17 '55



MI's TRACTOR-TRAILER HOUSEBOAT

See Page 84

David Lockhart

McCAHILL TESTS THE SENSATIONAL NEW CHEVROLET
THERE'S A FORTUNE WAITING FOR YOU IN CANADA

MECHANIX ILLUSTRATED

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Cover painting by David Lockhart

FEBRUARY 1955

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VOLUME 51, NUMBER 2

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MI's TRACTOR-TRAILER



Two 165-hp diesels pull connected units at about 15 mph or push powerboat alone at 30 mph. When Pop wants to go fishing, he simply uncouples powerboat and takes off.

HOUSEBOAT

**It combines a plush-lined houseboat that
will win the little woman's heart and a
handy sport-fisherman-type craft for you.**

By David Lockhart

ARE you frustrated by a Living Doll who refuses to go boating in anything less spacious than a mobile penthouse or a scaled-down Cristoforo Colombo? On the other hand, do you yearn for a fast, rugged little powerboat to take you fishing to an isolated duck blind, or even to a stuffy office? Well, if your hip pocket can stand the financial rap, here is your answer.

This design combines a plush-lined houseboat fit to win the heart of the most land-locked Little Woman, and a handy sport-fisherman type craft for you. The 50'x13' houseboat and the 35'x13' powerboat couple together into one unit, 80 feet long and articulated like a Pullman train. You might name them His and Hers . . . or Mack and Fruehof . . . or even Mutt and Jeff.

Moor the houseboat in some cozy cove, preferably midway between your favorite fishing spot and your wife's pet hairdresser, and you have a summer home with a ready-made swimming pool and no grass to cut. You will be commuting to the grindstone all week in the powerboat and using it weekends for fishing, or water-skiing maybe.

And when the leaves come tumbling down, tool the whole rig down to Florida and tuck the houseboat away in some palm-fringed lagoon where your doll can wallow the days away in sun-dappled water or in wall-to-wall slothfulness while you charge out to the Gulf Stream in the power job in quest of the matchless marlin.

When you return, bloody but unbathed, a tiled shower and a full-size inner-spring mattress may look pretty good even to you.

The powerboat is quite conventional except for a concave transom to match the semicircular bow of the houseboat. There are cabin-house controls as well as a flying bridge. The forward trunk cabin could accommodate a paid hand or an extra guest. There are minimum galley arrangements for heating soup and coffee and keeping the beer cold on the fishing forays. Opposite the galley counter is the lavatory.

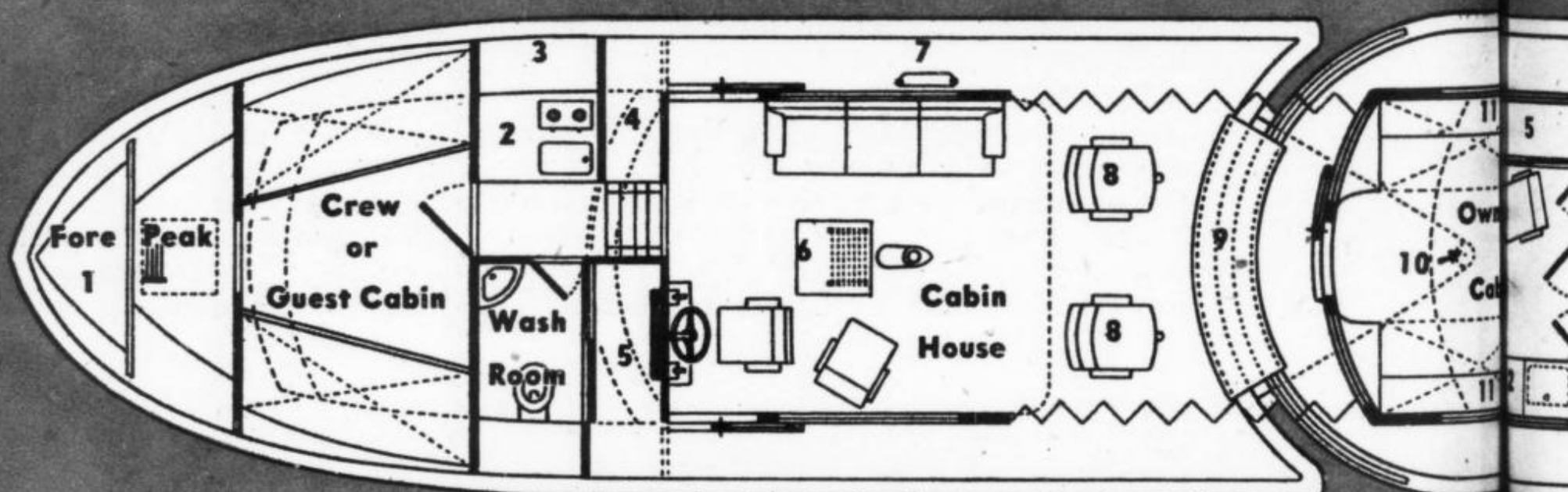
Two 165 hp diesels pull the whole rig at about 15 mph or push the powerboat alone at 30 mph. Variable pitch propellers might be used to advantage for greater bite when in tow. The exhaust is piped out the top of the hollow mast in deference to the houseboat passengers.

The occasional reversing that may be necessary employs techniques dear to the heart of every trailer fan. For any pinpoint backing, the powerboat uncouples, circles and makes fast alongside the houseboat.



Ball-and-socket coupling on houseboat's semicircular bow allows towboat 80-degree turning arc.

1. Chain locker; 2. Galley counter (refrigerator under counter); 3. Cupboard; 4. Oil-skin locker; 5. Hanging locker; 6. Engine hatch; 7. Flying bridge ladder; 8. Fighting chairs; 9. Gangway over bulwarks; 10. Pivot point of coupling; 11. Berth stows behind panel; 12. Dresser counter (basin, drawers under counter); 13. Water heater; 14. Dumb-waiter to sun deck; 15. Galley counter (sink, refrigerator below).



You can tool down to Florida in winter and wallow in the sun.

Of course, if you are really loaded (financially, that is) you can always install electrically powered hydrojets in the stern of the houseboat for use when reversing. They could be cut in by remote control from the powerboat.

The units couple together by a heavy triangular bracket, two points of which are fixed to the powerboat's stern. The third point attaches to the houseboat at the center of the semicircular bow by a ball-and-socket coupling that allows a turning arc of 80 degrees for the towboat. With the two hulls coupled together and an accordion Pullman-type canvas vestibule connecting the interiors of both craft, they become one integrated unit.

A catamaran design was chosen for the houseboat to overcome the noisy wave-slap and poor stability of the usual scow hull.

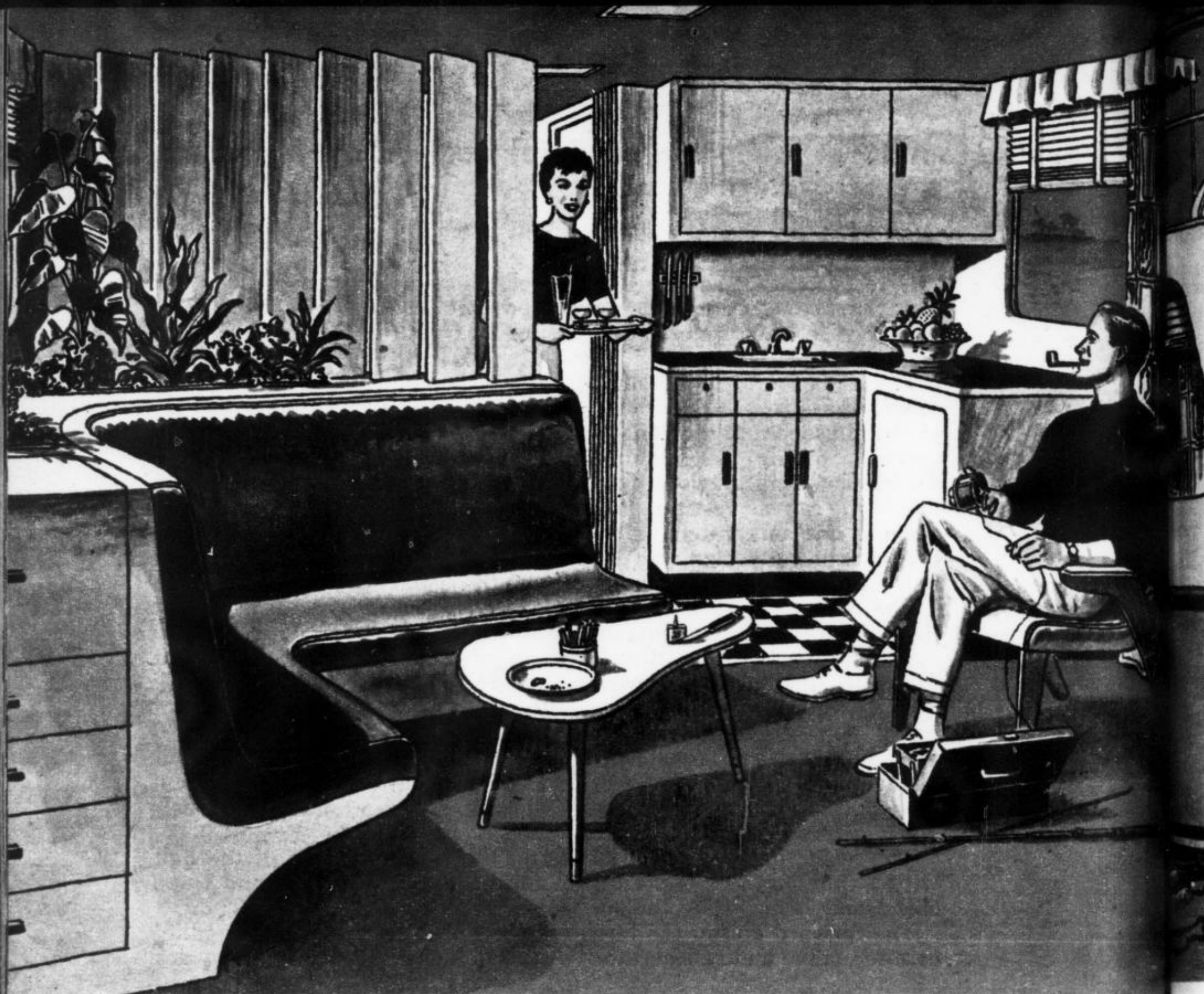
The owner's cabin is in the bow of the houseboat with a door in the forward bulkhead leading onto the foredeck, or when in tow, through the canvas vestibule into the deckhouse of the powerboat. The after end of the owner's cabin opens into a hallway running all the way aft to the main cabin, affording a clean sweep for maximum ventilation. On either side of the hall are guest cabins with upper and lower berths that fold into the wall panels by day. Each cabin has large hanging lockers, a dresser and its own wash basin to eliminate bottlenecks in the sanitation facilities. The toilet and shower are in separate compartments for the same reason.

The water heater is in a locker on the starboard side of the hall, with a dumb-waiter opposite for getting the celery tonic and water cress sandwiches up to the sun deck.

The forward end of the large main cabin is occupied by the galley counter, stove and refrigerator. Accordion doors can completely shut

16. Galley counter; 17. Gas stove; 18. Cupboard; 19. Accordion doors; 20. Louvered cabin-divider; 21. Built-in lounge; 22. Planters; 23. Dining table; 24. Coffee table; 25. Built-in desk; 26. Television set; 27. Fireplace (off-center flue bypasses stairway); 28. Sun deck stairway (firewood under stairway); 29. Bulwark boarding gate; 30. Swimming, boarding stage; 31. Permanent boarding ladder; 32. Shower room.





Sumptuous and spacious main cabin can be shut off from galley area by means of accordion doors.

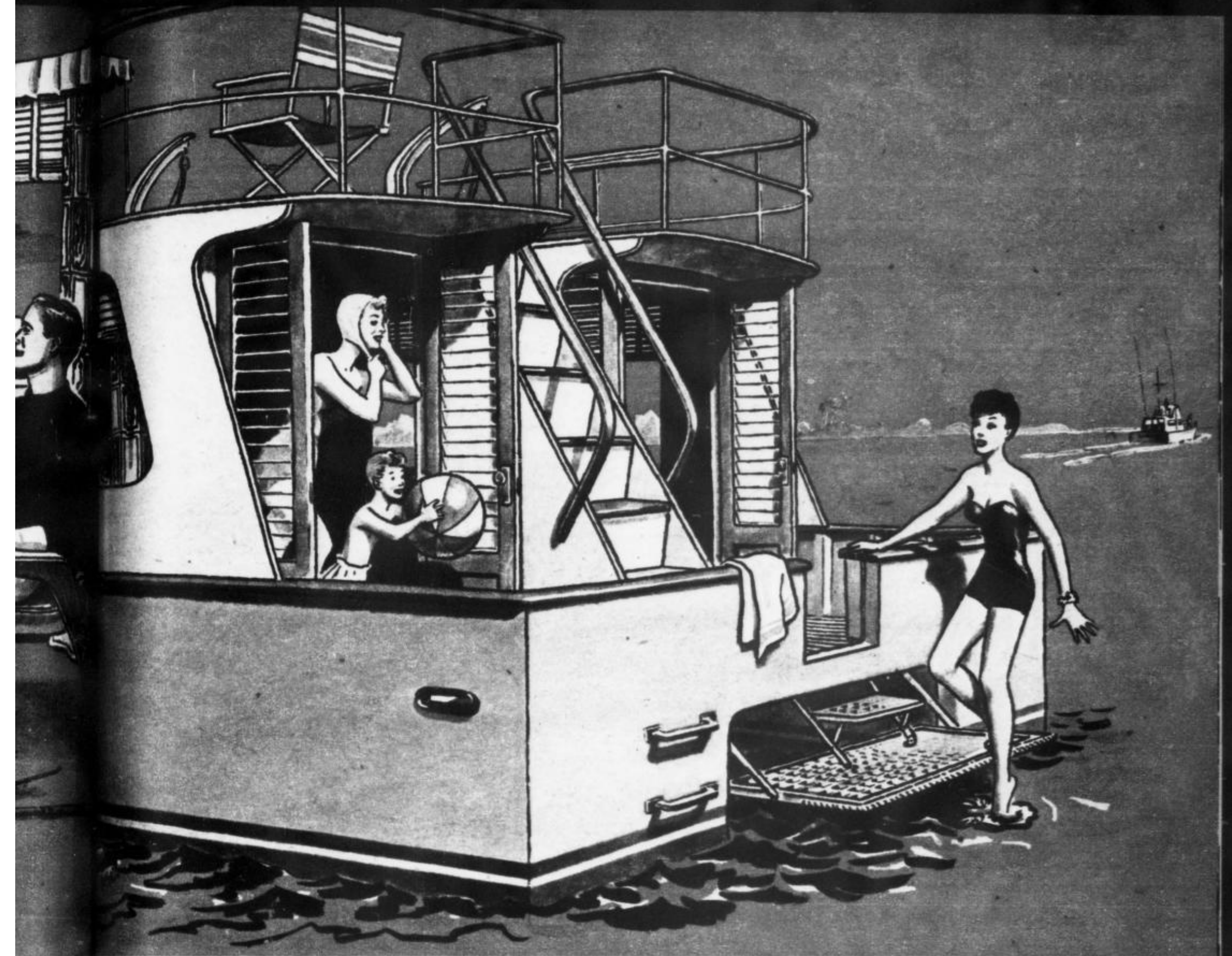
Moored in some cozy cove you have an ideal summer home

off both halves of the galley. Or, if the mood is convivial, the starboard half containing sink and refrigerator can be left open to serve as a bar—it's a view that is never offensive.

A built-in lounge unit divides the cabin, with vertical louvers cutting off the sight but not the ventilation of the cooking area. Another angle of the unit houses a desk. A dining table sets up in front of the lounge with places for eight persons and a coffee table can be substituted between meals.

House plant containers built into the back of the lounge unit and an honest-to-goodness fireplace in the after bulkhead of the cabin should make things about as homey as any split-level, ranch-type nest your wren could find.

Double glass doors flank either side of the fireplace and open onto the afterdeck where fireplace fuel is stowed under the sun deck stair-

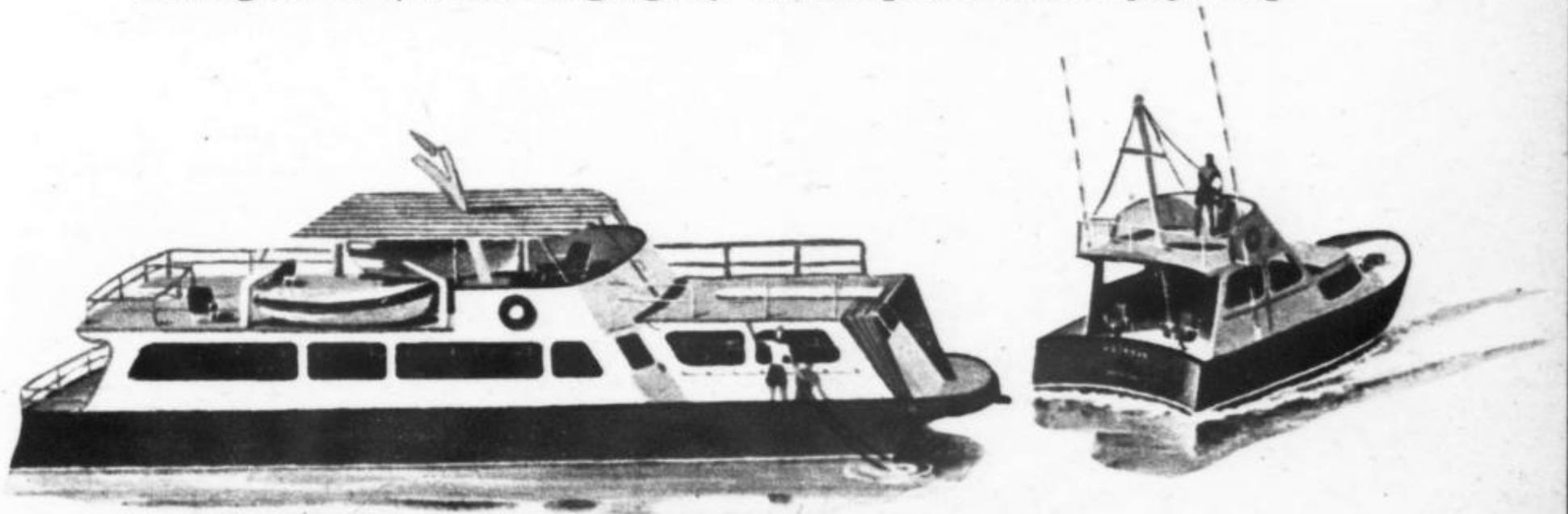


When luxurious craft is anchored during summer months you just dive off stern to go for a swim.

with a ready-made swimming pool and no grass to cut.

way. A bulwark gate in the center of the transom leads down to a swimming and boarding stage. Under way the stage folds forward and up, to stow against the top of the tunnel between the hulls of the houseboat.

A wind-dodger spans the forward end of the sun deck with a gate leading forward, across the gangway when in [Continued on page 199]



February, 1955

89

MODERN MECHANIX

January

AND INVENTIONS

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SEE PAGE 79

How Workshop Hobbies Win Success
By the President of Packard Motors

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MODERN MECHANIX AND INVENTIONS



JANUARY
1935

Volume XIII
Number 3

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Big \$500 Contest!



Have you a new idea for restoring old furniture? Modern Mechanix and Inventions offers a total of \$500 in cash for home improvement suggestions.

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Building World's Largest

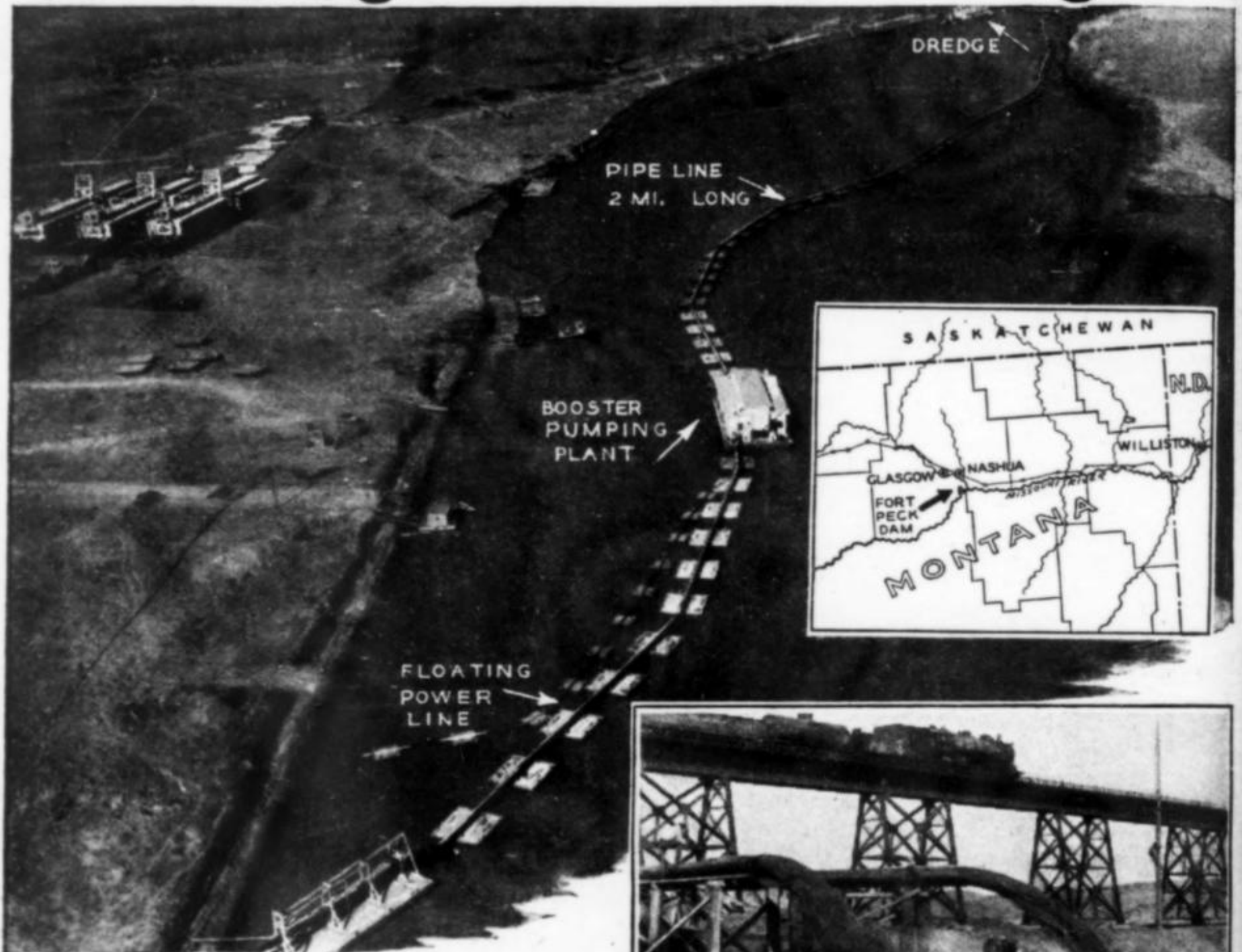


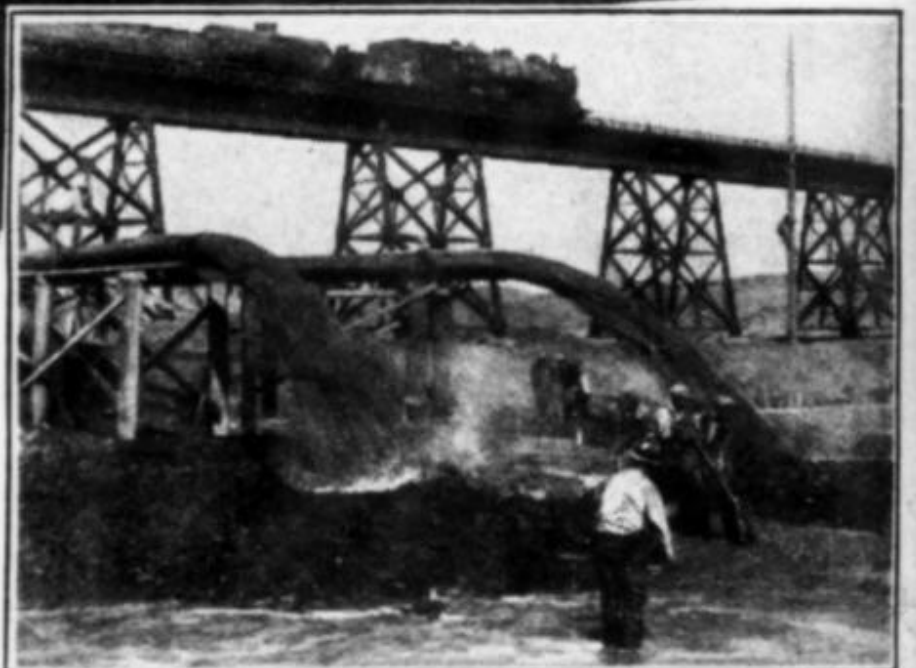
Photo shows one of four units which will pump 90,000,000 cu. yds. of earth into Fort Peck dam. Three other dredges are under construction, upper left. Smaller pontoons support 154,000 volt power line from Great Falls, Montana.

AT a point in eastern Montana where crowding bluffs force the winding Missouri river through a natural bottleneck, army engineers are engaged in one of the most gigantic projects of modern times—the building of the Fort Peck Dam, largest earth fill barrier in the world.

Not even Boulder Dam, Titan of the Southwest, eclipses the Fort Peck structure for sheer magnitude. For when the massive earthen wall is completed, the rampaging Missouri will be held in check by a mighty barrier almost four miles long.

From a sturdy base measuring 2677 feet from upstream to downstream toe, the twin slopes of the dam proper will rise 231 feet above the river bed to form the dam's crest, 100 feet wide. Across the main channel, engineers are throwing a main fill 8500 feet wide, to join a low dam, or dike which will march 11,000 feet up the west bank, for a total length of 19,500 feet.

The most unusual feature of the \$72,-



Four years hence this bridge will disappear as dam rises, filled by earth from a battery of 28-inch pipes as shown above. Map insert shows location of the mammoth project.

000,000 project is the choice of construction material. A 3-foot facing of concrete and rip-rap will protect the upstream slope, but the main body of the dam will be composed of earth fill—90,000,000 cubic yards of it, which will be pumped into position by a battery of dredges.

Held in check by this mighty wall of earth and stone will be a giant reservoir, 175 miles long and 16 miles wide. This huge lake will flood a district of about 380 square miles—250,000 acres—to a maximum depth of 230 feet. Boasting a shoreline of about 2500 miles, the Fort Peck reservoir will impound the staggering total of 20,000,000 acre feet of water, an amount which

(Continued on page 140)

st

Earth Fill Dam

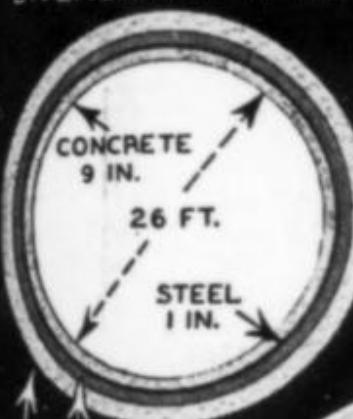
IMPOUNDED WATERS
WOULD MAKE RIVER
TO THE MOON
69 FT. WIDE,
10 FT. DEEP.

Some idea of the
amount of water
impounded by the
dam is shown in
the sketch above.

11,000 FT. DIKE EXTENDS
DAM TO TOTAL LENGTH
OF 19,500 FEET

RESERVOIR 175 MILES LONG
AND 16 MILES WIDE HAS
2,500 MILE SHORE LINE.
HOLDS 20,000,000 ACRE FEET
OF WATER

CROSS-SECTION OF
DIVERSION TUNNEL



GROUT - 6 IN.

CONCRETE
21 IN.

MAIN FILL

8,500 FT.

UPSTREAM FACE
PROTECTED BY 3 FT.
OF RIP-RAP

100 FT.

DIVERSION TUNNEL
INTAKE

FINE
EARTH
CORE

231 FT.

STEEL PILING
TO PREVENT
SEEPAGE

867 FT.

HIGHWAY
ON CREST
OF DAM

1,810 FT.

CONTROL TOWER
REGULATES FLOW
OF IMPOUNDED
WATER

R.R. TO MOVE 9,000,000
TONS OF MATERIAL FOR
ENTIRE PROJECT

DIVERSION TUNNEL
OUTLET

This cutaway view
shows construction fea-
tures of dam. Note that
water is routed around
the dam through four
huge diversion tunnels.

20,000 MILE
TRAIN

90,000,000 CU. YDS. OF
EARTH REQUIRED FOR
THE DAM WOULD FILL
R.R. GONDOLA CARS
REACHING 4/5 AROUND
THE WORLD

5,395 FT. 1/8 IN.

material to Fort Peck dam site.
9,000,000 tons of mate-
Railroad will transport

TOTAL MATERIAL USED
WOULD BUILD 110 WASH-
INGTON MONUMENTS

FAWCETT'S

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MODERN MECHANICS

AND INVENTIONS

12 CU

STRANGEST PLANE
EVER BUILT
SEE PAGE 67

STEWART
ROUSE

WII I GIANT INSECTS RII F WORLD2

Other Fawcett magazines are Screen Play Secrets, Triple-X, Battle Stories, True Confessions, Mystic Magazine and Hollywood.

MODERN MECHANICS AND INVENTIONS

December, 1930

PRICE 25 CENTS

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HIGH SPOTS IN THIS ISSUE

Another big new contest is announced in this issue. You'll find all the details on page 77. With the long winter nights coming on, the radio fans will again come into their own. On page 114 you will find complete plans and instructions for building a real long-distance low-power transmitter. And then turn to page 80 and find out how a man made a million dollars with crazy inventions.

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Pilot Gene Shank
Famous Aviator, Holder of
Light Plane Endurance
Flight Record

Weston Farmer
Naval Architect and Light
Plane Designer

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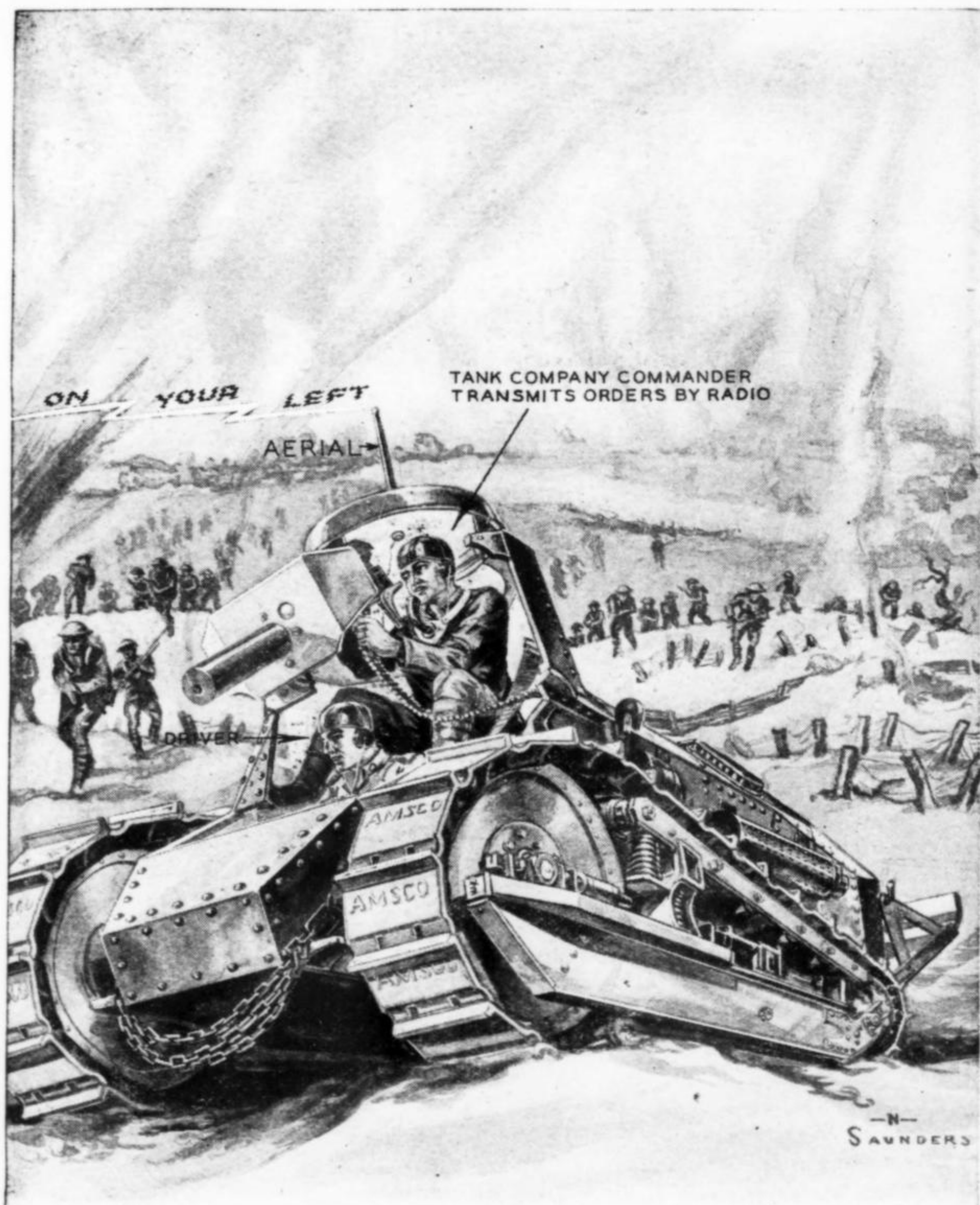
Published monthly by Fawcett Publications, Inc., at 501 7th Ave. So., Minneapolis, Minnesota. MODERN MECHANICS AND INVENTIONS entered as second class matter September 20th, 1928, at the Post Office, Minneapolis, Minnesota, under the act of March 3rd, 1879. W. H. Fawcett, Publisher; Roscoe Fawcett, Managing Editor; Jack Smalley, Assistant Managing Editor. Copyright 1930. Ray Ryan, Advertising Manager; Chicago office, 35 East Wacker Drive (Phone State 2955); New York office, 52 Vanderbilt Avenue, Room 606 (Phone Vanderbilt 8490). All manuscripts should be addressed to our editorial office at 529 So. 7th St., Minneapolis, Minn. Manuscripts will not be returned unless accompanied by return postage. Advertising forms close on the 20th of the third preceding month. Price 25 cents a copy; \$2.50 a year in the United States and possessions. Other Postal Unions, \$3.00 per year. Printed in U. S. A.

TANK MANEUVERS



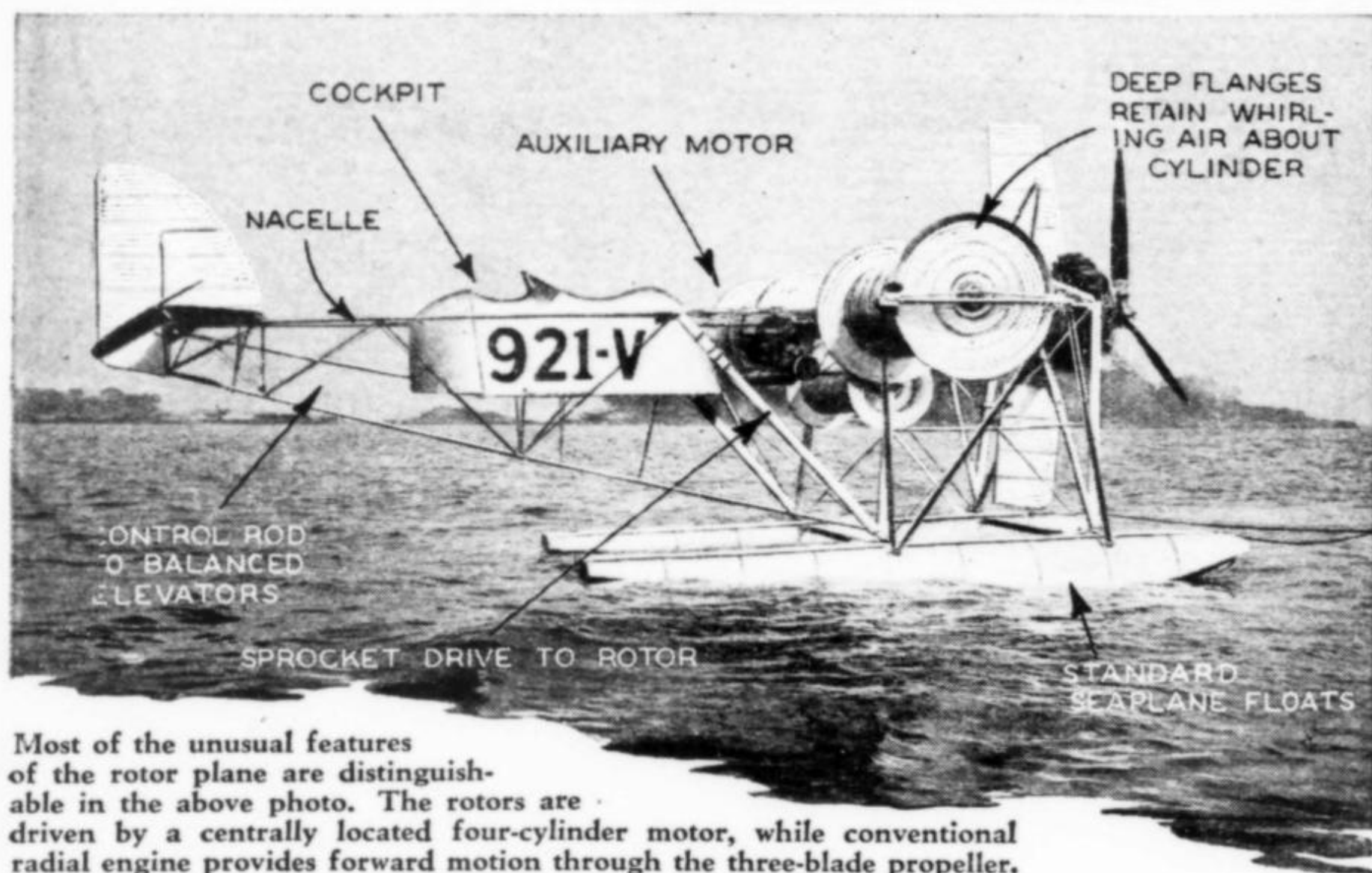
One of the latest developments in the mechanization of the army is the installation of radios in tanks for the transmission and receipt of orders. Control of tanks in action, since they were first introduced by the British during the World war, has been at once an important and difficult task, hitherto performed by officers who walked beside the tank and signalled with flags—a duty both dangerous and unsatisfactory. Modern tanks are now being equipped with radio, the company and section commanders having both receiving and short-wave transmitting sets, while the other tanks

Controlled by RADIO



are only equipped to receive. The illustration shows a tank company advancing to clear the way for the infantry. The tank in the foreground is cut away to show the driver and the company commander seated in the turret. The commander has spotted the camouflaged pillbox in the left foreground and is sending an order by radio to the tank on his right to turn and smash the emplacement. Tanks shown here are armed with machine guns, other types are equipped with small cannon.

This ROTOR Airplane



Most of the unusual features of the rotor plane are distinguishable in the above photo. The rotors are driven by a centrally located four-cylinder motor, while conventional radial engine provides forward motion through the three-blade propeller.

THREE aeronautical inventors, presumably picked from the upper-crust of the country's roster of advanced aviation engineers, have completed and publicly demonstrated their conception of an airplane which will work on the principles which Anton Flettner applied to his famous rotor ship six years ago.

Their machine eliminates the conventional wings and in their stead it has, among other innovations three rotors which are mounted on axles on either side of the fuselage and are driven by a centrally-located, four-cylinder air-cooled engine. The span of the rotors, which are really wind-driven cylinders, is considerably less than that of an ordinary airplane.

The inventors estimate that their seaplane will lift ten times the weight of an ordinary plane of equal weight or lift area. Also they have concentrated on strength of structure and predict that the rotor plane will reduce resistance and consequently attain greater speed.

Anton Flettner, the German engineer and physicist, was the one to discover the laws concerning moving, rotating cylinders and

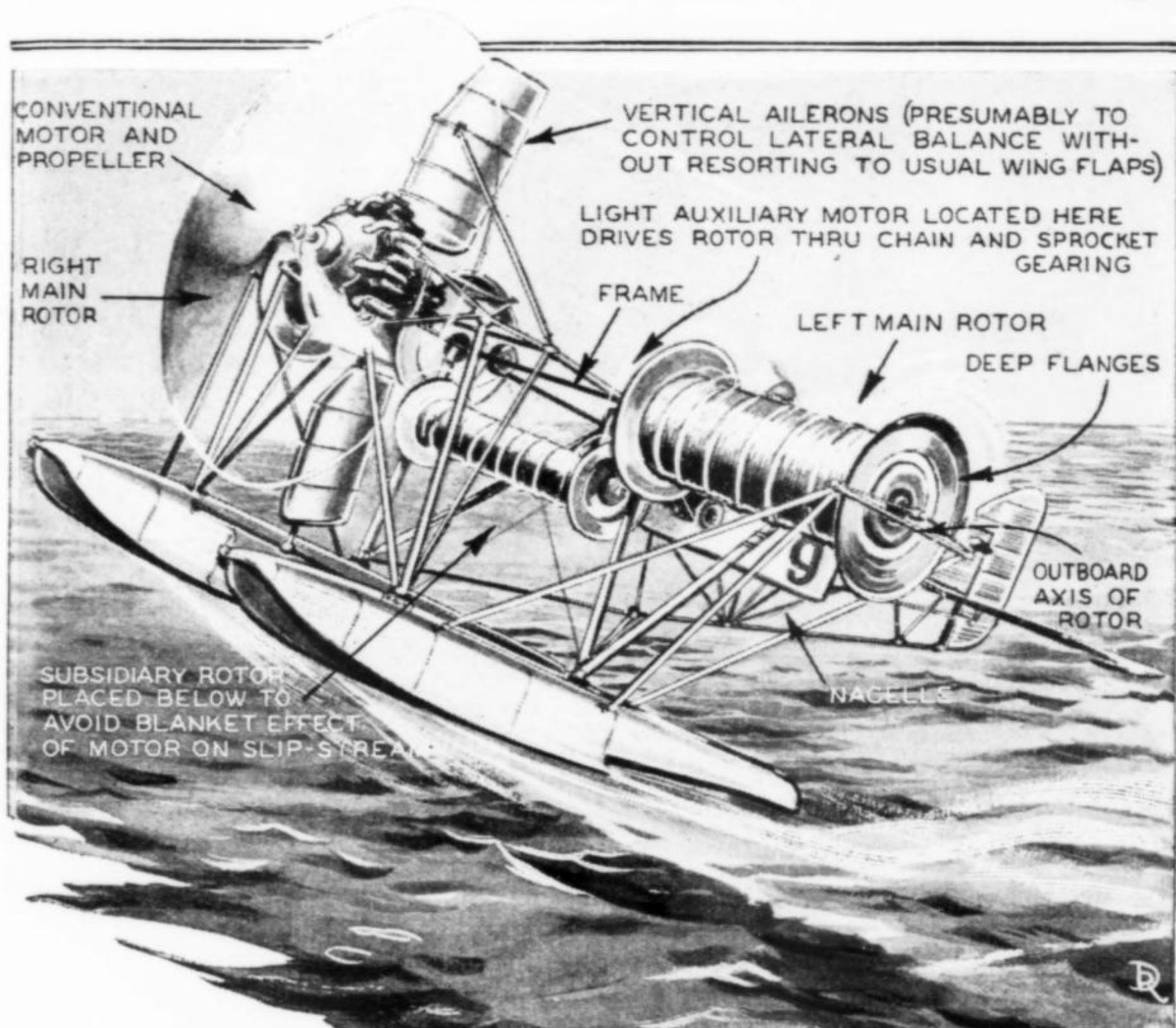
harnessed the winds of the Atlantic Ocean in such a way by his rotor-propelled ship, the *Baden-Baden*, that he negotiated the trip from Kiel, Germany, to New York City without any other mechanical aid in 1924.

Flettner's successful crossing stimulated thought among the three inventors involved in the latest of aviation's experiments. Although the inventors were pledged to secrecy on the plane's design and make-up, others well informed in aeronautical matters were able to produce a careful and minute report of their ship's construction.

Their flying machine is made of duralumin. It resembles a seaplane in most respects. There is a single motor in the nose which supplies traction through a three-bladed steel propeller. An auxiliary air-cooled motor provides the power to rotate the cylinders. The latter supplant the wings.

The rotors are arranged in three sections, two on each side of the center longitudinal line of the machine. In the forepart there is an outriggered rudder and behind there is a small pair of tandem cockpits, together with a set of tail surfaces. Between the motor and the cockpits two long booms are

Flies WITHOUT Wings

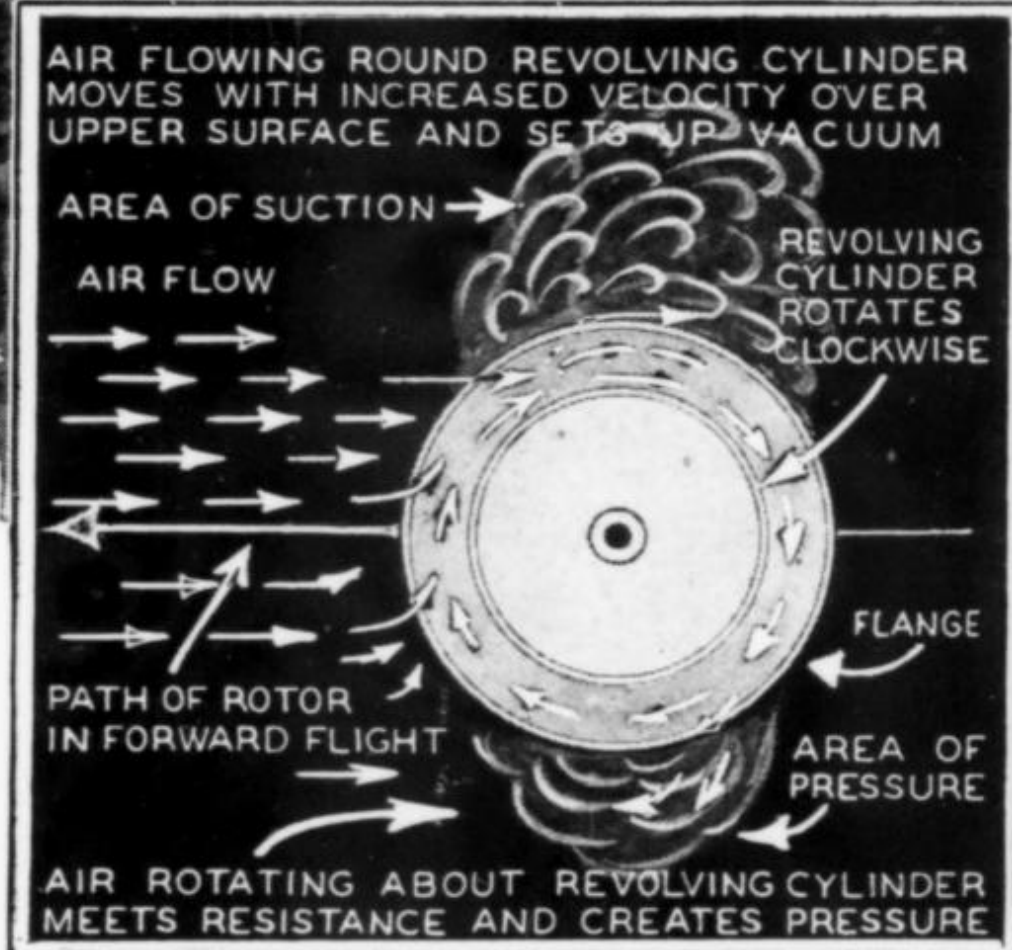


used instead of the usual four longerons.

The undercarriage is of the regular design as are the floats used. However, the pontoons are attached by "V" struts to the outer ends of the rotor axles in addition to the regular mounting.

Each rotor is closed at the end by a flange which is much bigger than the cylinder itself. The diameter of the rotor is about two feet while the flange is four feet. Here it might be noted that the rotor plane will lend itself for storage purposes easier than the conventional type because of the reduction of the wing span.

The drawings show how the principle of the rotor in aviation works out.



The above diagram shows how rotor principle works.

MODERN MECHANICS

AND INVENTIONS

FEB.
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**Freak Plane
Crashes**
See Page 44

What Will Happen to Flying? by
Capt. Eddie Rickenbacker

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February, 1929

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MODERN MECHANICS

AND INVENTIONS

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This magazine is not connected or associated with any other magazine of a scientific or mechanical nature.

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(Both stories copyright, 1929, by Edgar Rice Burroughs.)

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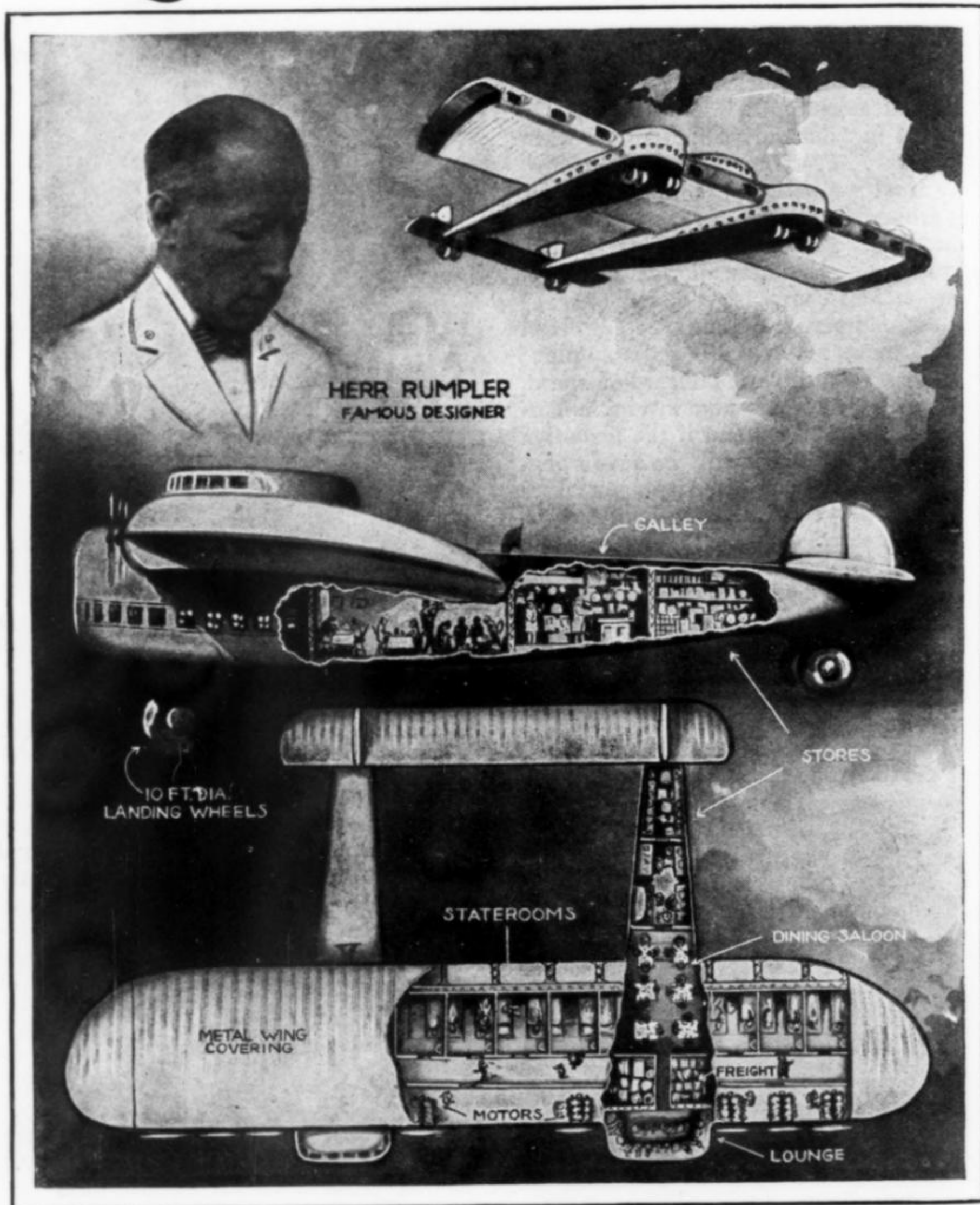
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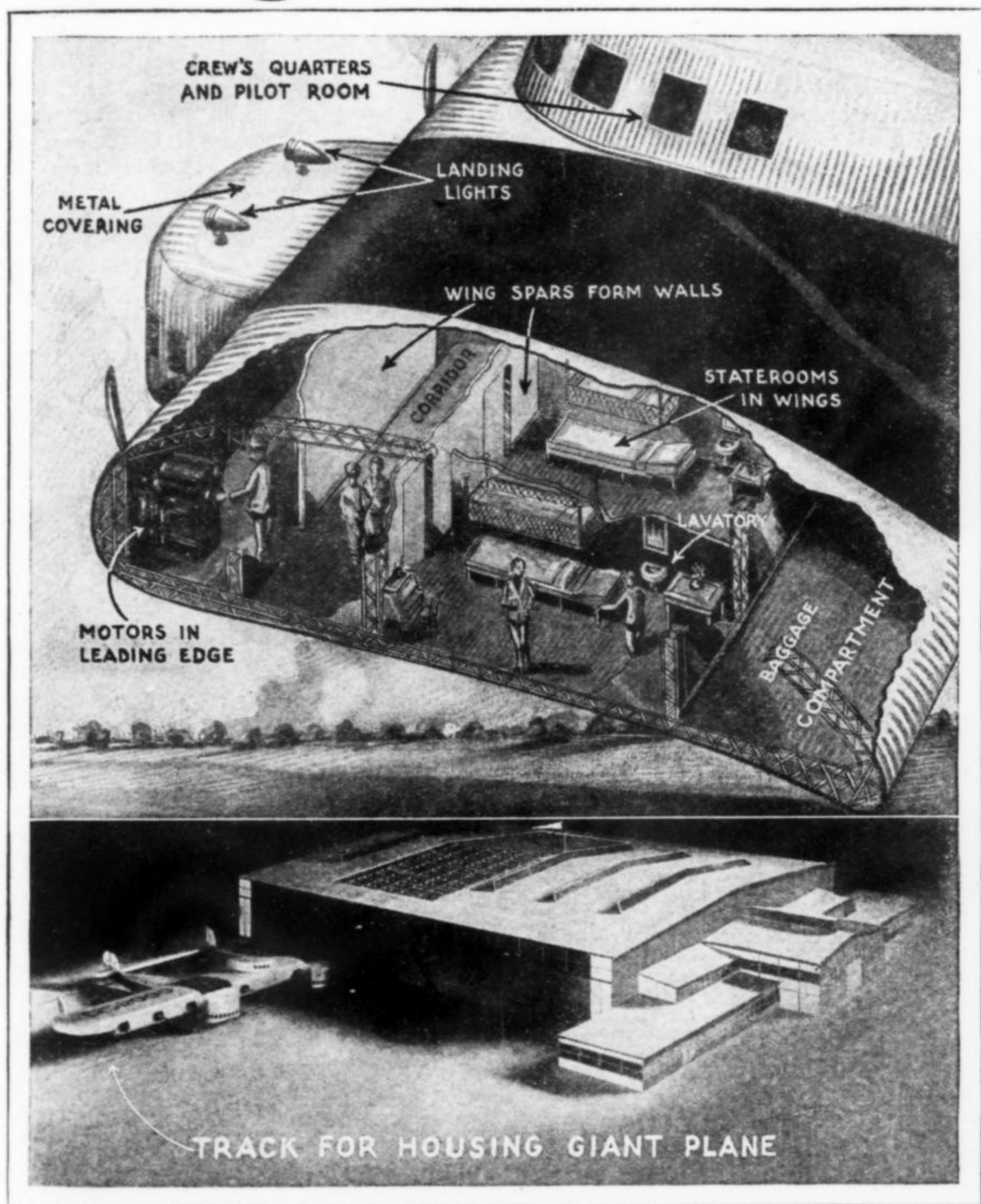
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RUMPLER *Designs*



Herr Rumpler, famous designer of Germany's war time fighting planes, is turning his peace time activities to good account in developing the world's largest airplanes. Rumpler, shown above in a characteristic pose at his drafting board, is now building an enormous monoplane which will have wings large enough to place staterooms in. A new blunt-nosed wing section is used to effect this design. Huge wheels, 10 feet in diameter, will be used on the landing gear. All motors will be easily accessible in flight. Navigating quarters will be in a cabin atop the wing.

Largest PLANE



The new Rumpler monoplane, now nearing completion in Germany, will have a span of 300 feet and a chord of 50 feet. It will be so large that space between the sides of each wing spar will be used for hallways, staterooms and motor compartments. A specially designed, power operated air field railway track will be constructed for housing the new giant. The cross section drawing shows the disposition of the arrangement. The plane will cruise at 82 m. p. h. A gigantic hangar is shown in the photo below with the big ship on the track. Note room for two of these monsters.

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MODERN MECHANICS AND INVENTIONS

ICE TONGS
MOORING CRADLE
SEE PAGE 86

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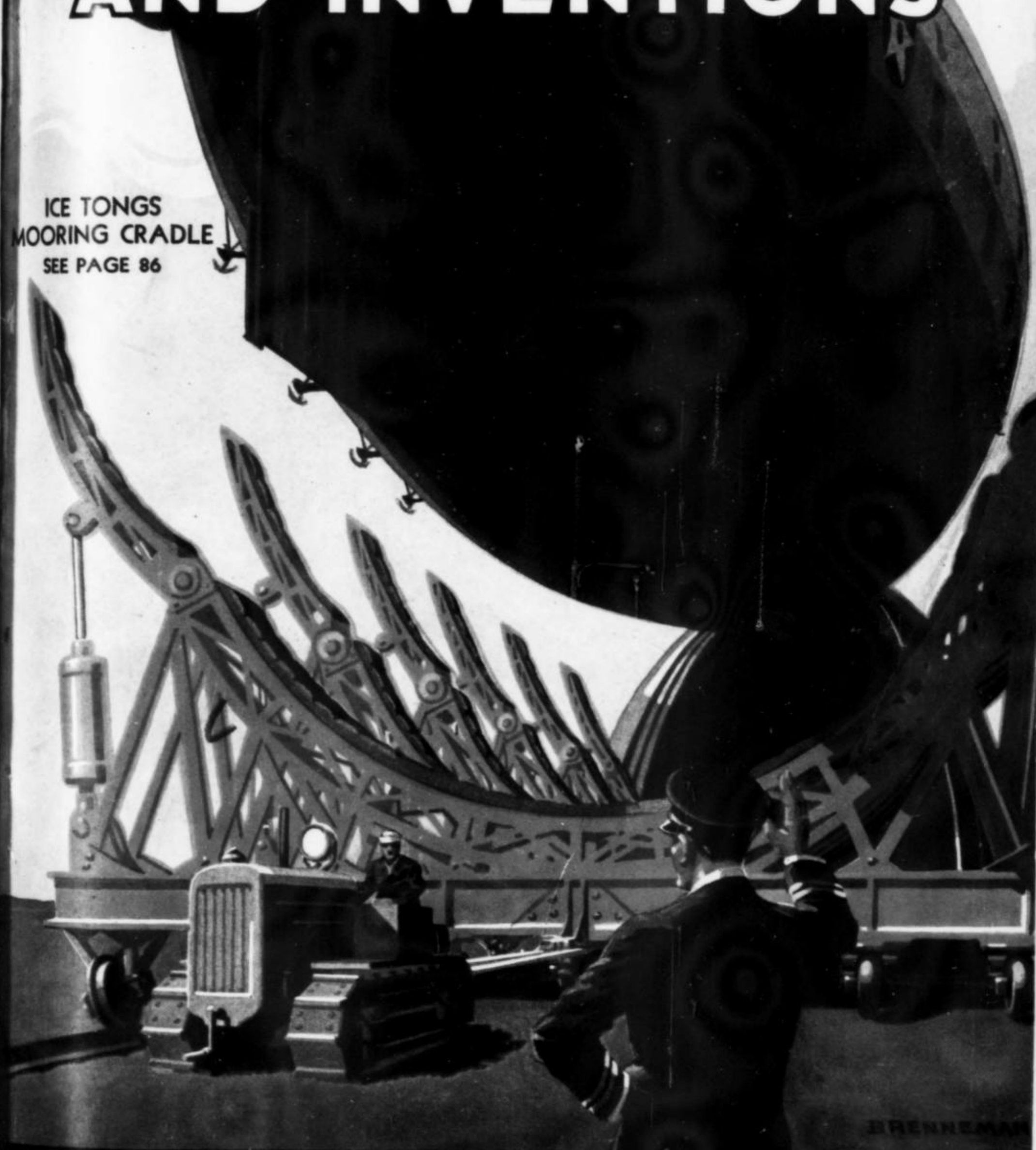
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WILL WE LIVE IN VACUUM BOTTLES?

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MODERN MECHANICS AND INVENTIONS

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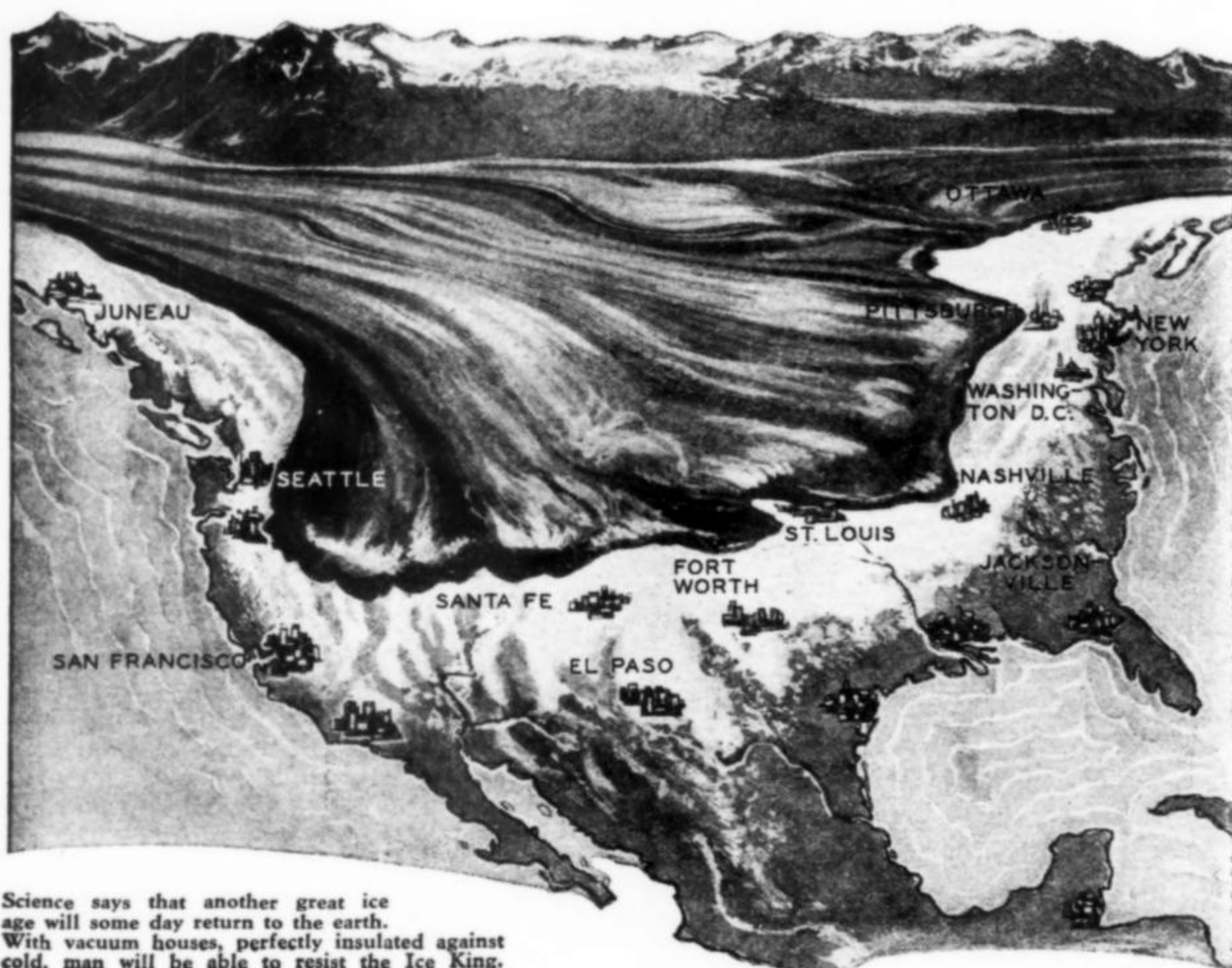
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WILL WE LIVE in



Science says that another great ice age will some day return to the earth. With vacuum houses, perfectly insulated against cold, man will be able to resist the Ice King.

What is a vacuum bottle house? It sounds fantastic, but science is developing a new type of house with vacuum walls, adapting the principles of the familiar thermos bottle, which will be so perfectly insulated that one ton of coal will do the work of nine. Some day you may live in one!

IN HIS fascinating book, "The Time Machine," H. G. Wells looks forward to the day when man, in an awkward attempt to survive a dying sun and a frigid and dreary earth, will take to the ground to live like ants—an idea which does not flatter the ingenuity of scientists who have been working to develop the perfect house, in which comfort is assured regardless of outside temperatures.

It is extremely unlikely that the next ice age, which scientists assure us will some day return to the earth, will occur soon enough to be of personal interest to any of us. But every winter the residents of northern latitudes must protect themselves against an ice age in miniature, when cold winds roar down from the top of the world.

Why, then, have we never adopted the

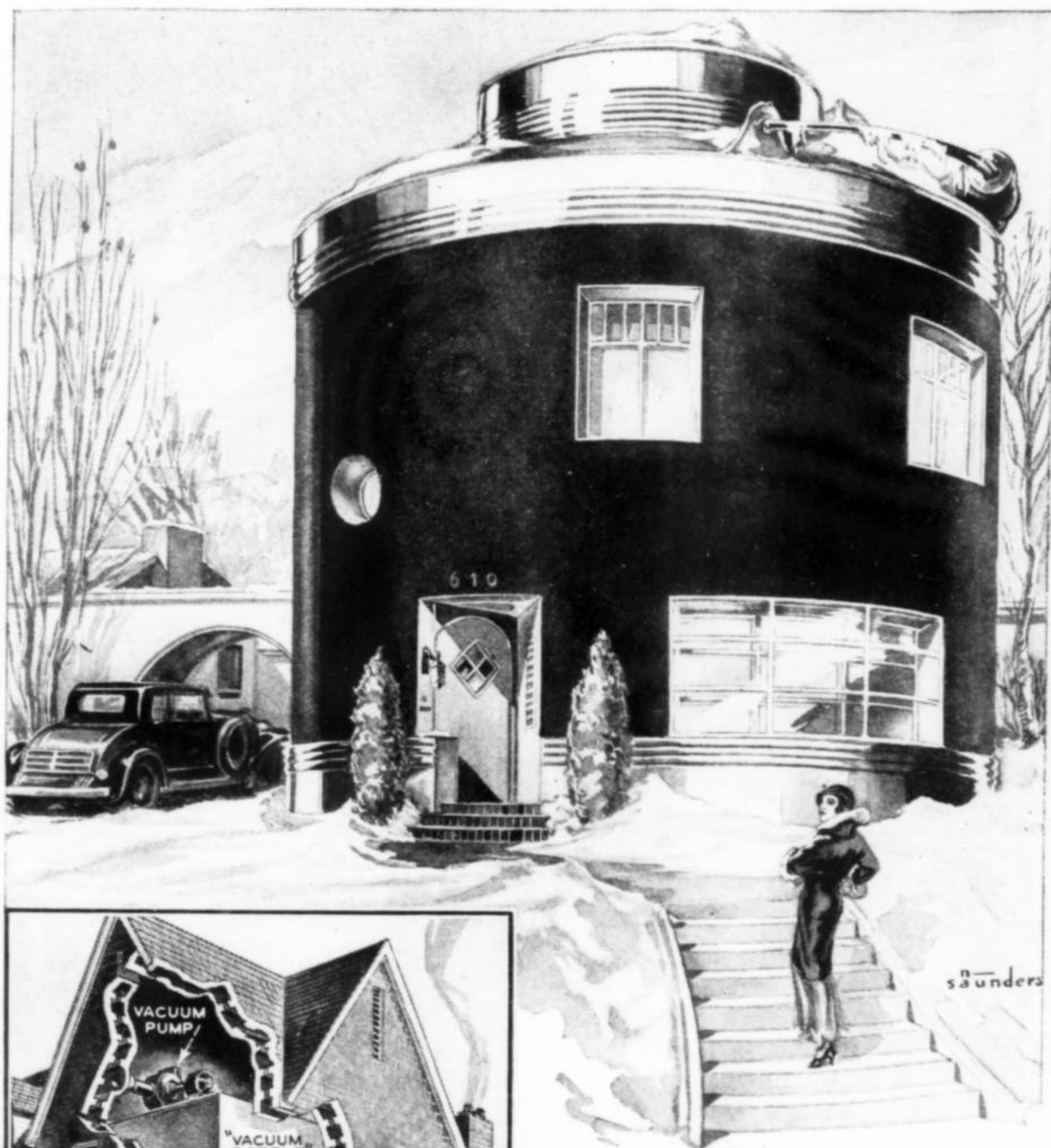
most perfect form of insulated house known to science—the vacuum bottle? Not that the house would necessarily look like a vacuum jug; it would simply make use of the insulation principles which keep liquids in such a container hot or cold for hours.

Vacuum Walls Can Now Be Built

Heat cannot leap through an empty space. It requires a tangible medium through which to pass if it wants to "go places." Until now it has been impracticable to build houses with vacuum walls, because of the tremendous strength necessary to resist atmospheric pressure.

Recently, however, metals have started to come into their own in small house construction. Steel framework, similar to that used in skyscraper skeletons, is beginning

Vacuum Bottles? by JOHN L. RAYMOND



Walls of cellular construction, as shown above, from which the air is evacuated by a small pump, are perfectly practical to construct. A 10-room house with "vacuum bottle" walls could be heated for an entire winter by two tons of coal, as compared with 18 required for the same house with frame walls. Such houses are unquestionably on the way. Walls will probably be made of poured concrete.

The coming vacuum bottle house may or may not look like a thermos jug, but it will probably be built along simplified modernistic lines, with thick vacuum walls.

to compete with wood construction for homes. Copper houses have been introduced in Germany. Concrete has long been popular. Any of these materials are strong enough for the construction of vacuum house walls.

It is obvious that we must be careful in the design and construction of our vacuum bottle houses if they are to withstand an atmospheric pressure that will amount to over ten pounds per square inch (this is for

Need for Vacuum Houses Emphasized by Possible Return of Ice Age



This view of an erupting Japanese volcano gives an idea of the tremendous volume of smoke and ash ejected into the atmosphere—sufficient to affect weather conditions.

a partial and not a complete vacuum). No merely double concrete wall will withstand this.

Consequently the wall must be made cellular; that is, honey-combed with tiny chambers inter-connected so that air will pass freely from one to the other. A good idea of this construction will be gained from the drawing. By the use of this sort of construction, great pressure may be safely withstood and there would be no danger of a house falling victim to the relentless atmosphere.

Nine Homes Heated at Cost of One

It would be utterly impossible to construct such a house so that it would not leak air. For this reason, it would be necessary to operate at all times a small, fractional horsepower motor operating a small vacuum pump. This would keep the tiny compartments emptied of most of the air and

Blanketed by dust and ash thrown high into the air by volcanoes, the sun's heat would be shut off from the earth, permitting an ice cap to form. This is one scientific theory as to the cause of ice ages in the earth's history.

would add very little to the cost of heating a home.

Calculation shows that a ten-room vacuum house might be heated with about two tons of coal for an entire winter. To do this heating with a house of ordinary construction, about 18 tons of coal would be needed at a minimum.

Vacuum House Cool in Summer

In summer a vacuum bottle house would be as cool as it is warm in winter, since the vacuum blanket shuts out the blistering heat waves just as effectively as it turns away cold.

Such a type of house will unquestionably be developed within the next few years—long before the bleak ice age of Mr. Wells blankets the earth in snow. Yet even today we cannot ignore the ice age entirely, for science tells us that we are still living in such an age. The recent report of the German expedition to Greenland, led by Dr. Alfred Wegener, who lost his life there, furnishes striking evidence of this truth.

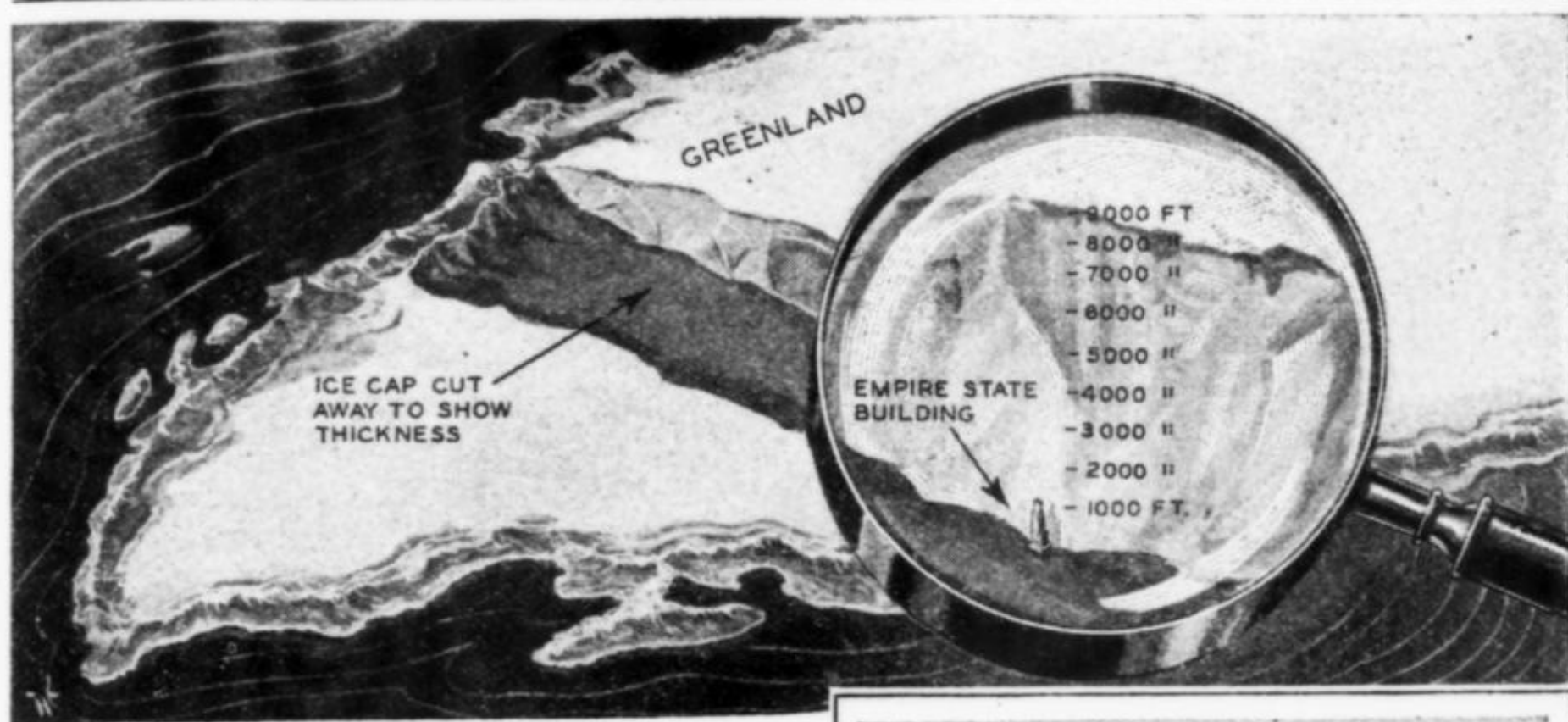
Practically all of interior Greenland is covered with a great ice-cap, a remnant of the days when glaciers crept down from our own north and gouged out the Great Lakes. The existence of the Greenland ice has long been known, but no accurate measurements of its depth had ever been made.

Greenland Ice Cap 8,800 Feet Thick

The Wegener expedition, however, brought back the astonishing information that the ice is 8,800 feet thick at the center of Greenland! More than a mile and three-fifths of solid ice—pile eighteen Washington monuments on top of each other, and they would just about equal the thickness of Greenland's ice blanket!

These tremendous depths were measured by a seismograph, the instrument which re-

Expedition Finds Ice Cap of Greenland to be 8,800 Ft. Thick at Center



That a remnant of the ice age still lingers with us is proved by the recent Wegener expedition to Greenland, which found the continent to be covered with an ice blanket 8,800 feet thick at its center—a mile and three-fifths of solid ice! This is the source of huge icebergs.

cords earthquakes. This instrument measured vibrations set up in the earth, and in this case the vibrations were artificially produced by dynamite explosions. The method was simple but ingenious.

The length of time required for the waves of the explosion, traveling over the surface of the ice, to the observer with the seismograph, is recorded. The velocity of the waves over the surface is known. A second set of waves pass through the ice to the ground beneath and are reflected back to the seismograph. By checking the difference in elapsed time, the angle of travel of the waves can be figured, and the depth of ice ascertained by simple mathematics.

Many Ways in Which Ice Age Could Return

If Greenland is the last remnant of the ice age which has left us Niagara Falls and countless other landmarks, what are the reasons which scientists put forth to support the belief that some day the ice age will return?

There are many ways, say scientists. Suppose there should occur throughout the world violent and continued eruption of a number of volcanoes. Voluminous clouds of smoke and ash would be poured from their vitals. This volcanic debris would rise in the atmosphere miles above the clouds and hang there. The sun would be obscured; its rays could not penetrate to the earth through the floating, heavy ash and dust.

Shut off from the warm rays of the sun the earth would grow cold on its surface. Rain and snow falling would turn into ice. Then more rain and snow would fall. Cold would beget cold; ice would beget ice and, before many years the earth would be well on its way to icing up again.



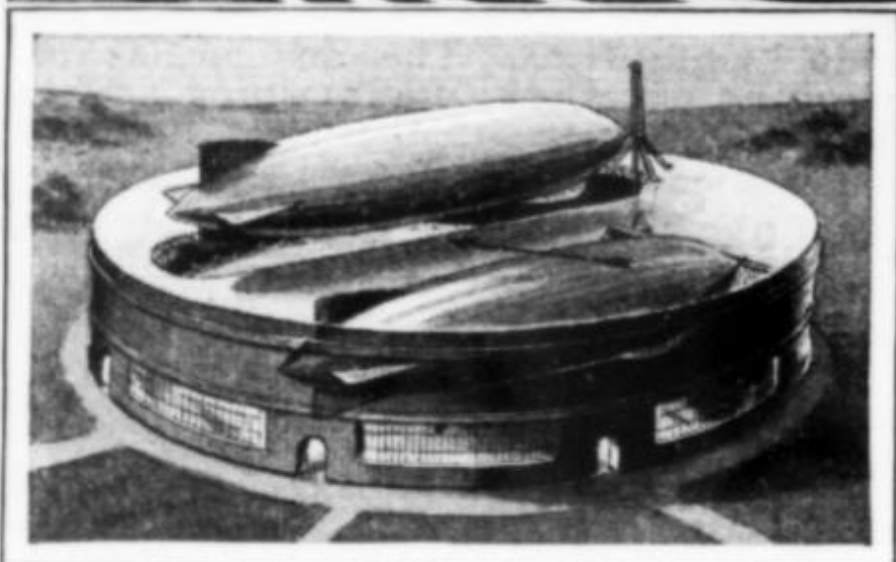
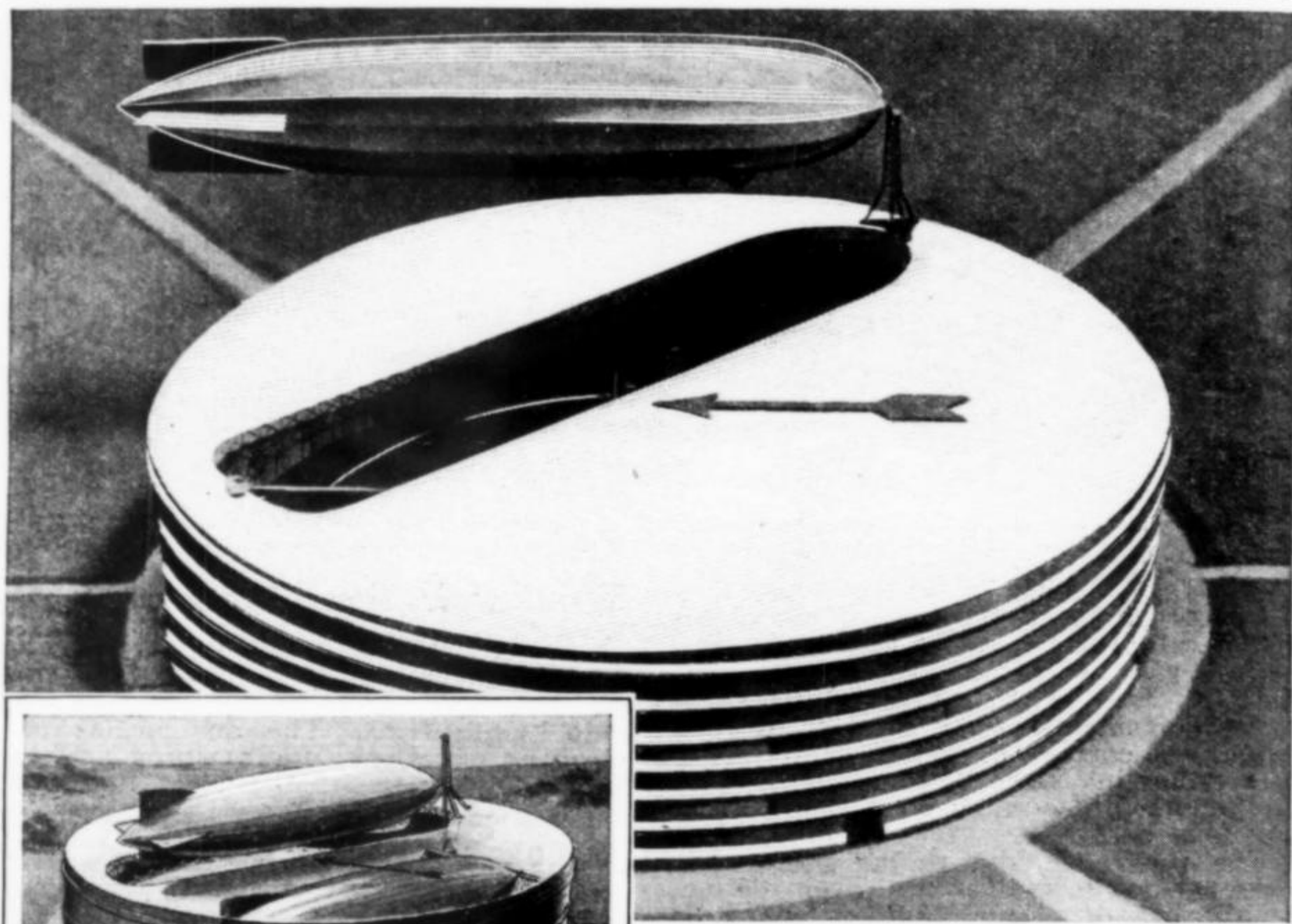
Taken on an Alaskan glacier, this photo gives a graphic conception of what desolation a return of the ice age would bring to the earth.

This is one of the theories, advanced by meteorologists, as to icing up in past ages. Another is that temperature conditions varied with the amount of carbon dioxide in the atmosphere. It became thinned out, permitting the heat absorbed by the earth from the sun to be thrown off without check. As a result the earth's surface grew cold and ice began to accumulate. Once the accumulation started it would run its course. Enormous plant life may have been responsible for the thinning out of the carbon dioxide in the air.

Shifting Storm Tracks Could Freeze World

A third theory is that of shifting storm tracks over the surface of the earth—of the paths of high and low pressures. The shifting of these tracks, it is held, would affect

Mooring Devices Simplify



This "roundhouse hangar" is designed to simplify the housing of airships. The mooring mast permits the ship to slide down into the hangar through the hole in the roof. Once inside it can be shifted about at will. The entire hangar revolves, and the arrow on the roof always points out the wind direction for the benefit of pilots about to land.

WITH the recent successful test flights of the Navy's new "Akron", the world's largest airship, and the announcement that the German builders of the "Graf Zeppelin" are going ahead with the construction of a ship even more huge than the "Akron", the interest of inventors has turned toward the mooring and housing problems presented by these gigantic lighter-than-air ships. When one realizes that the "Akron" is as long as two city blocks, some of the difficulties can be appreciated.

The New "Roundhouse" Hangar

Shown above is one proposed solution of the hangar problem—a "roundhouse" hangar which can be turned about on rails so that the arrow painted on its top always points in the prevailing direction of the wind. On the rim of the roof is a mooring mast, of conventional type except for an elevator arrangement which permits the dirigible to slide downward through an opening in the roof into the inside of the hangar.

In this way, two or even more airships, depending on their size, can be accommodated. When trans-ocean crossings in airships are accomplished on regular schedule, as will probably be the case within the next five years, hangars of this type will come into their own.

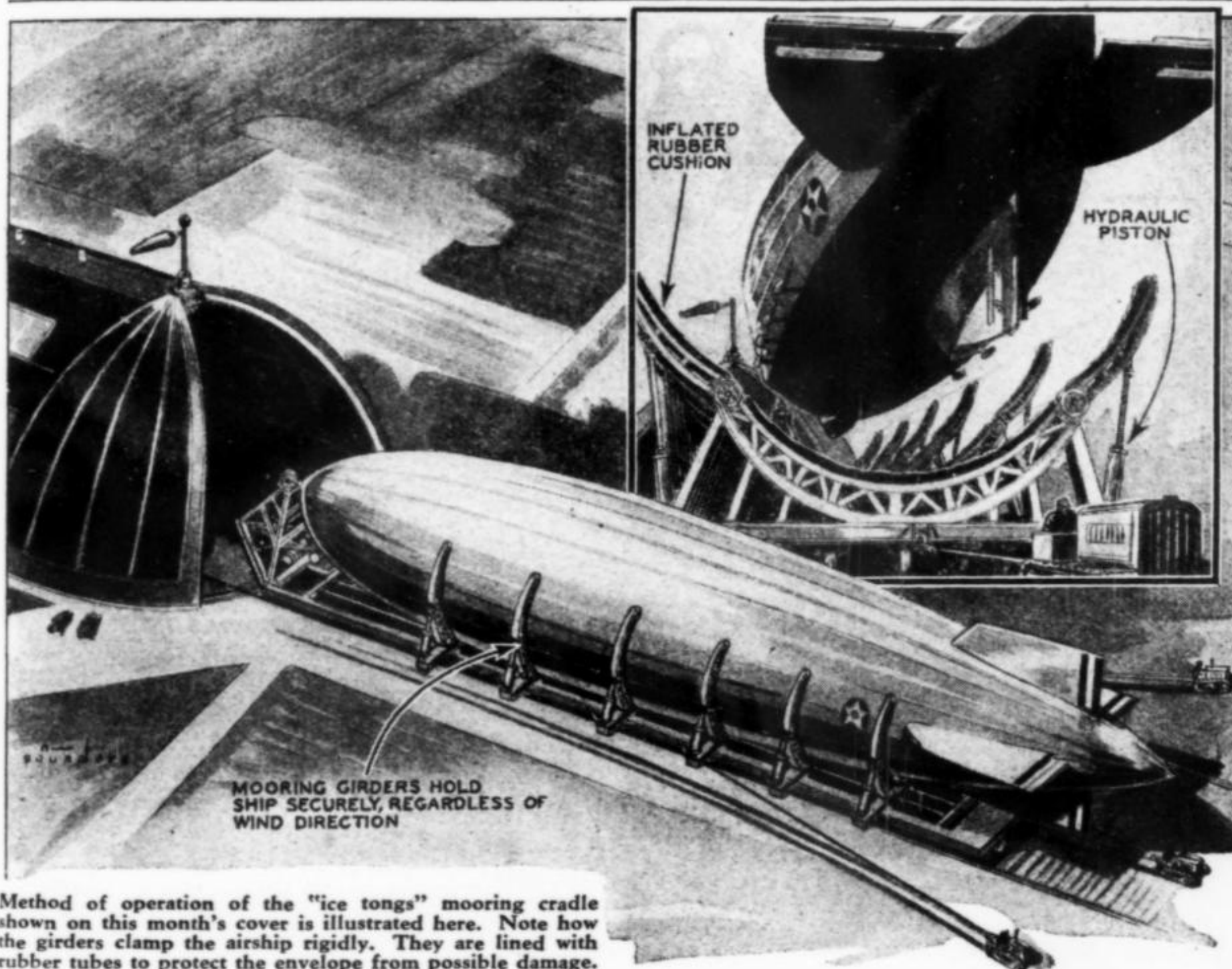
Mooring in Wind Difficult

One serious disadvantage of an airship, however, is the impossibility of docking it in heavy winds. An extensive ground crew is required, and the usual practice is to let the ship "ride out" a storm.

Illustrated in these pages, and on this month's cover, however, is an ingenious device which clamps on an airship like a series of huge ice tongs, holding it in a secure grip and making it a simple task to get the ship safely out of its hangar, regardless of wind velocity.

This mooring dock is the invention of Ernest Pitman, governing director of the British firm of Sir Isaac Pitman and Sons. The familiar Pitman system of shorthand, it will be remembered, was the invention

Docking of Big Airships



Method of operation of the "ice tongs" mooring cradle shown on this month's cover is illustrated here. Note how the girders clamp the airship rigidly. They are lined with rubber tubes to protect the envelope from possible damage.

of Sir Isaac, a relative of Ernest Pitman.

There is nothing complicated about the design of the mooring cradle. Its length is approximately the same as the ship it is to handle. At intervals corresponding to the ring-like girders which form part of the framework of the airship are placed semi-circular girders with tong-like arms which close in on the ship with a tight grasp when actuated by hydraulic pistons connected to the arms.

Cradle Holds Ship Securely

The cradle to which the "tongs" are attached is mounted on a chassis supported by a combination of airplane wheels and flanged steel wheels. The latter are similar in design to the usual locomotive wheel and are designed for running on rails, but the flanges are placed underneath the rails rather than at the sides. This is to hold the cradle securely to the rails to resist sudden blasts of wind.

When off the rails, the cradle can be moved into any desired position relative to the wind, for the airplane wheels are fitted with casters. To prevent damage to the airship, the girders which clasp it are

lined with a rubber tube which can be inflated, much like an automobile tire.

At the end of the cradle is a regular mooring mast containing the machinery for operating the device. The mechanism is carefully distributed as to weight to prevent the cradle's tipping over in a sudden gust of wind.

Problem Not Completely Solved

Tractors will haul the ship and cradle out of the hangar, off the rails, and onto the field, lining it up in the wind for taking off. Airships coming into land could not settle into the cradle with safety, however, except when the wind is light. The problem of safe handling in any kind of weather is still far from completely solved.

It is difficult for persons who have not dealt at first hand with the subject to realize the tremendous force exerted on an airship by even a light breeze. The surface area presented to the wind is much larger than that offered by a schooner with all sails set. The ship, being lighter than air, therefore acts very much like an overgrown toy balloon except for restraints put upon it by its crew.